the OIL AND GAS JOURNAL

LEE C. MOORE CORPORATION mounts the 56″ fastline sheave of its 133′ cantilever drilling mast on Timken tapered roller bearings to provide load-carrying capacity to spare, maintain alignment.

TIMKEN® bearings on fastline sheave defy thrust on Moore 133 ft. mast

SINCE Lee C. Moore Corp. mounted the 56″ fastline sheave of its 133 ft. special service cantilever drilling mast on Timken® tapered roller bearings, thrust loads are no problem.

Tapered construction lets Timken bearings take both thrust and radial loads in any combination. In this application Timken bearings keep the fastline sheave in positive alignment. And because of full line contact between rollers and races, Timken bearings have the capacity to take extra-heavy loads with ease.

Timken bearings practically eliminate friction. They're designed by geometric law to give true rolling motion and manufactured to live up to their design. Timken bearings are made with the highest quality steel obtainable. We make it ourselves—to be sure—the only U. S. bearing manufacturer that takes this extra quality step.

For all the oil field equipment you build or buy, specify bearings with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

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TAPERED ROLLER BEARINGS

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PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 OCTOBER 4, 1954

Peace

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That comfortable "no-worry" feeling when you're using Lane-Wells Bridging Plugs! They've set, right where you wanted 'em, after running in easily on wireline... you know they'll stay there, giving you leakproof pack-off, as long as you want 'em—and there's no trouble when you want 'em out of the way; both drill out or knock down *fast!* That's why operators all across the country say, "Get 'em—Set 'em—Forget 'em—NO Problems!"

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the OIL AND GAS JOURNAL

OCTOBER 4, 1954 VOL. 53 NO. 22

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In Brief . . .

1. EFFICIENT SPACING . . . An engineering study of the Madison lime reservoir, Tioga field, North Dakota has shown the reservoir to be continuous and interconnected within the confines of the pool. An 80-acre spacing pattern is recommended for the field because: (1) no increase in production rate would be obtained at greater well density; (2) this spacing is adequate to drain the reservoir efficiently.

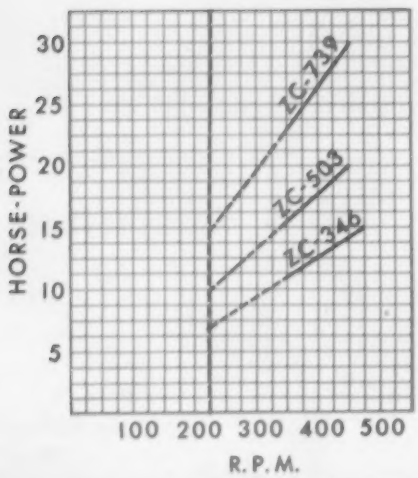
2. AUTOMATIC BLENDING . . . A radical, significant step has been made by Shell Oil Co. in using a section of pipeline for automatic blending of various components into finished gasoline. Instead of going into conventional refinery blending tanks, the components go through automatic proportioning equipment directly into a line. A mechanical brain governs the process and provides a running check on the blending accuracy.

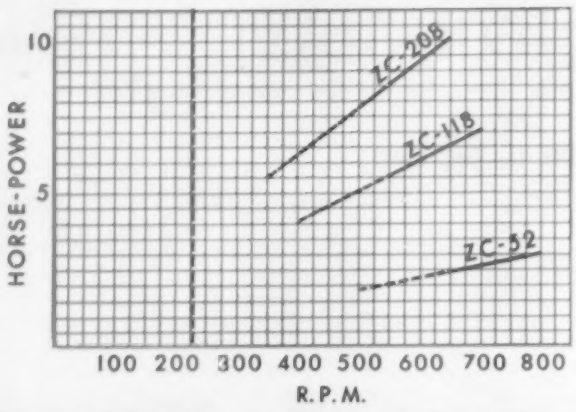
3. COSTS HALVED . . . Use of concrete piling rather than solid blocks more than halved foundation costs for pumps and small vessels in the Platformer-Udex unit at Great Southern Chemical Corp.'s Corpus Christi, Tex., plant. Concrete was poured into holes to form two or three reinforced pilings at each location, and then a surface mat was poured to support the pump or vessel. Much construction time was saved by this procedure.

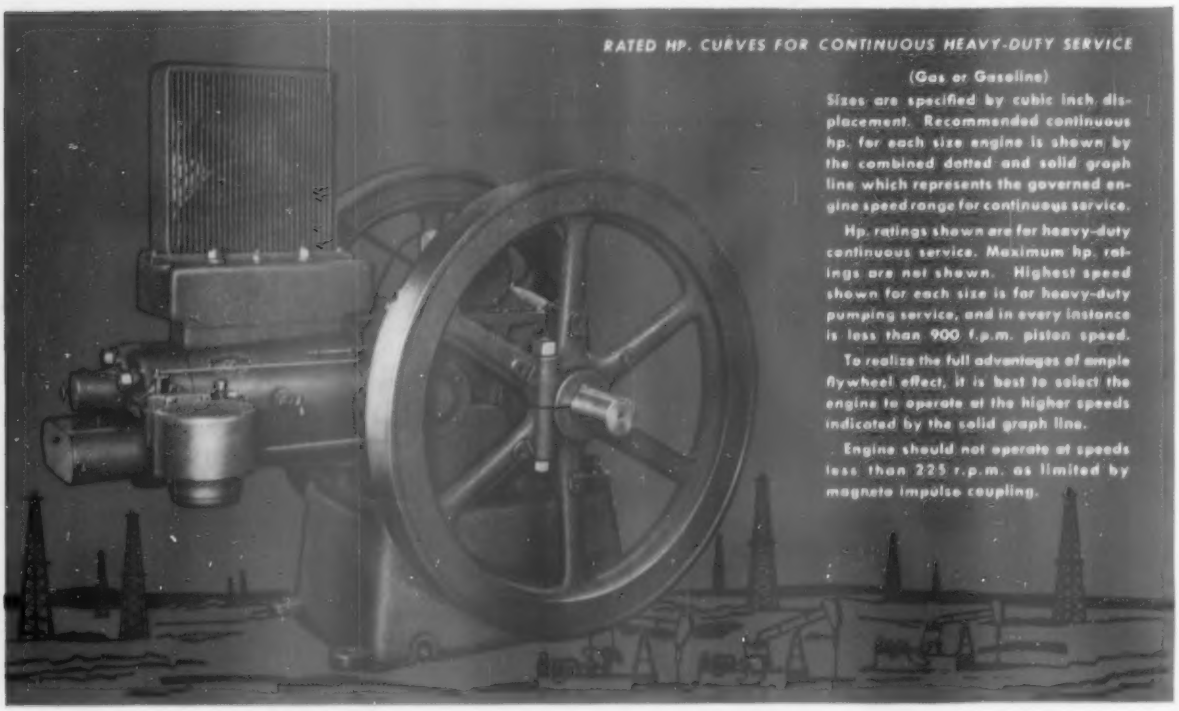
4. RIG MOVES FAST . . . A new two-trailer rig put in service by Magnolia Petroleum Co. in West Texas is making its moves between locations with a minimum of lost time. Only 12 hours was required recently to move the rig 35 miles to a new location, rig up, and commence operations.

5. EFFICIENT MAINTENANCE . . . Proper planning and scheduling, with close job followup and rigorous supervision, are necessary for efficient and economical maintenance. In addition maintenance work should be divided into proper divisions, as follows: routine work, routine assigned maintenance, emergency repair work, periodic equipment overhaul, preventive maintenance, and long-range capital improvements. Projects are handled differently in each of these divisions.

Most efficient turnaround is obtained at N.C.R.A.'s plant at six-month intervals.



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(Gas or Gasoline)
Sizes are specified by cubic inch displacement. Recommended continuous hp. for each size engine is shown by the combined dotted and solid graph line which represents the governed engine speed range for continuous service.
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Engine should not operate at speeds less than 225 r.p.m. as limited by magneto impulse coupling.

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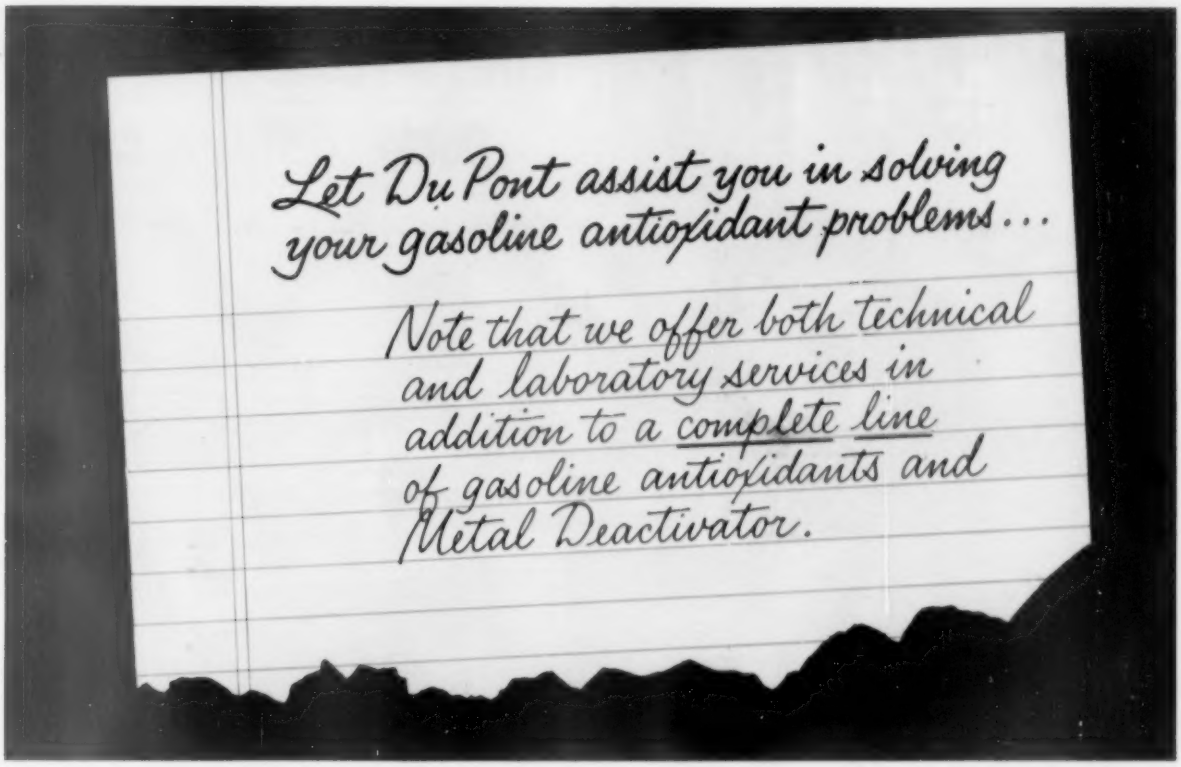
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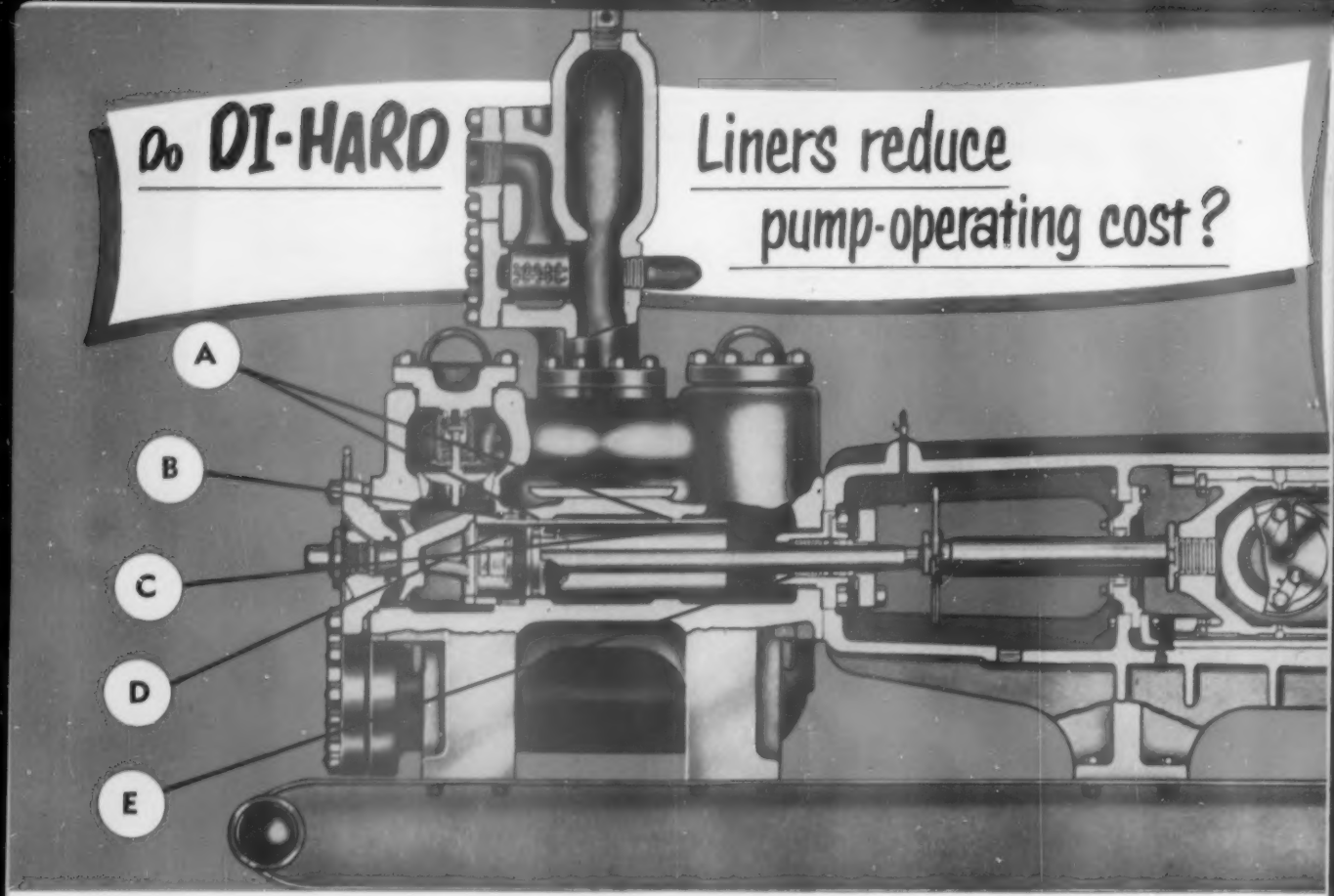

"Pushers" who use them say "YES"...

and here's *WHY!*

"OILWELL" DI-HARD LINERS are priced competitively with other brands . . . yet field tests show that they average up to 43% MORE service than liners of other makes.

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And how does this affect pump operating costs?

Accurate fit avoids abnormal clearance between outside liner diameter and the cylinder bore. When such abnormal clearance exists, the liner tends to "work" under pressure; damaging the pump at support points (A), and causing the outside liner packing to extrude (B). These factors also cause the liners to rest low in the cylinder bore, which accelerates internal liner wear (C), fluid piston wear (D) and premature wear of packing in the piston-rod stuffing box (E).

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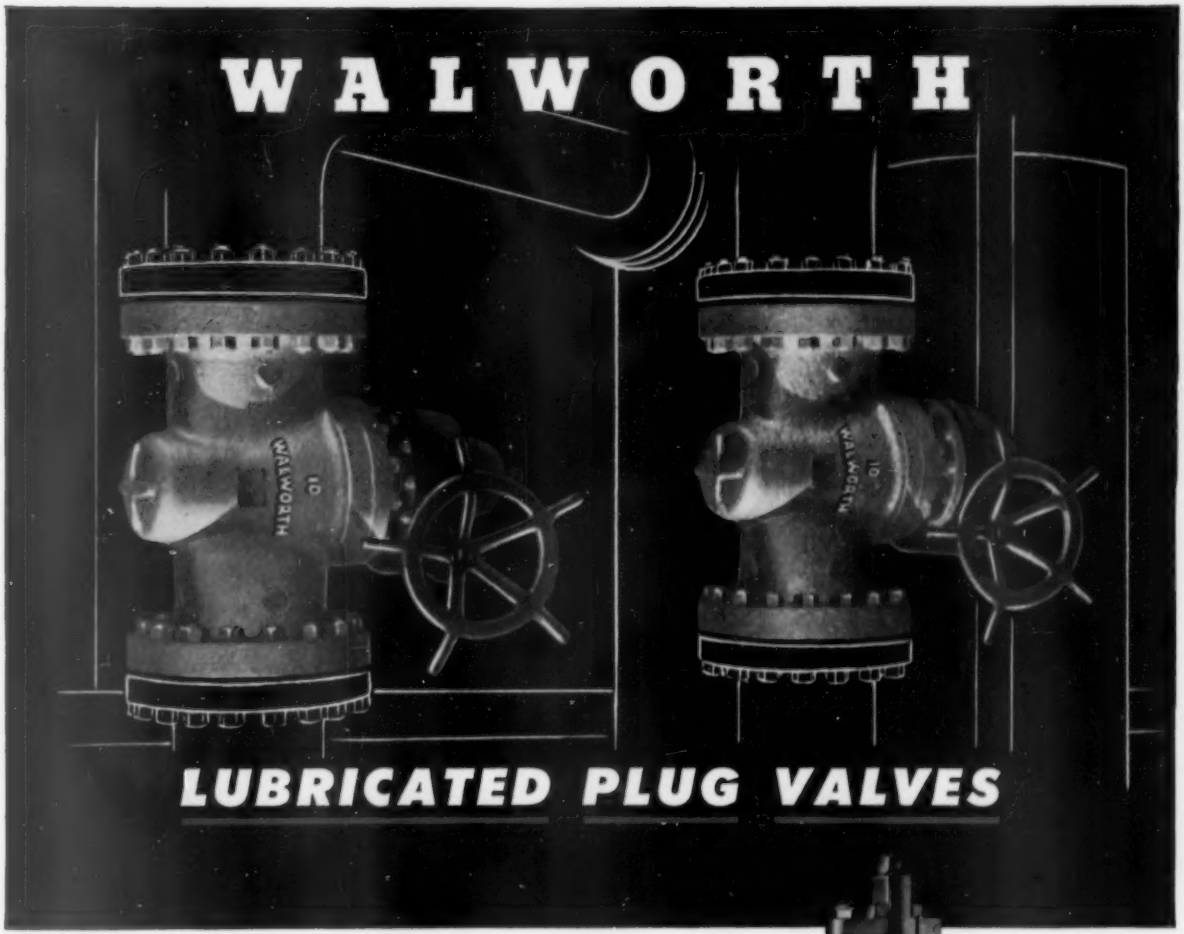

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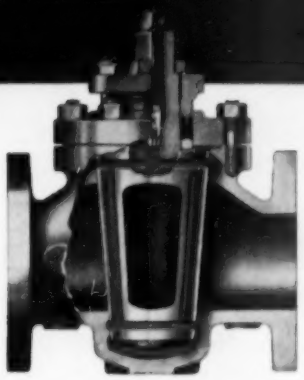

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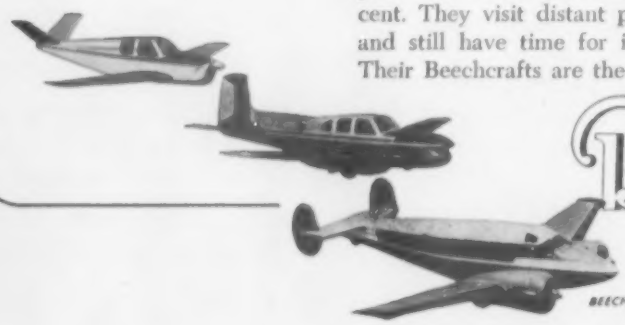

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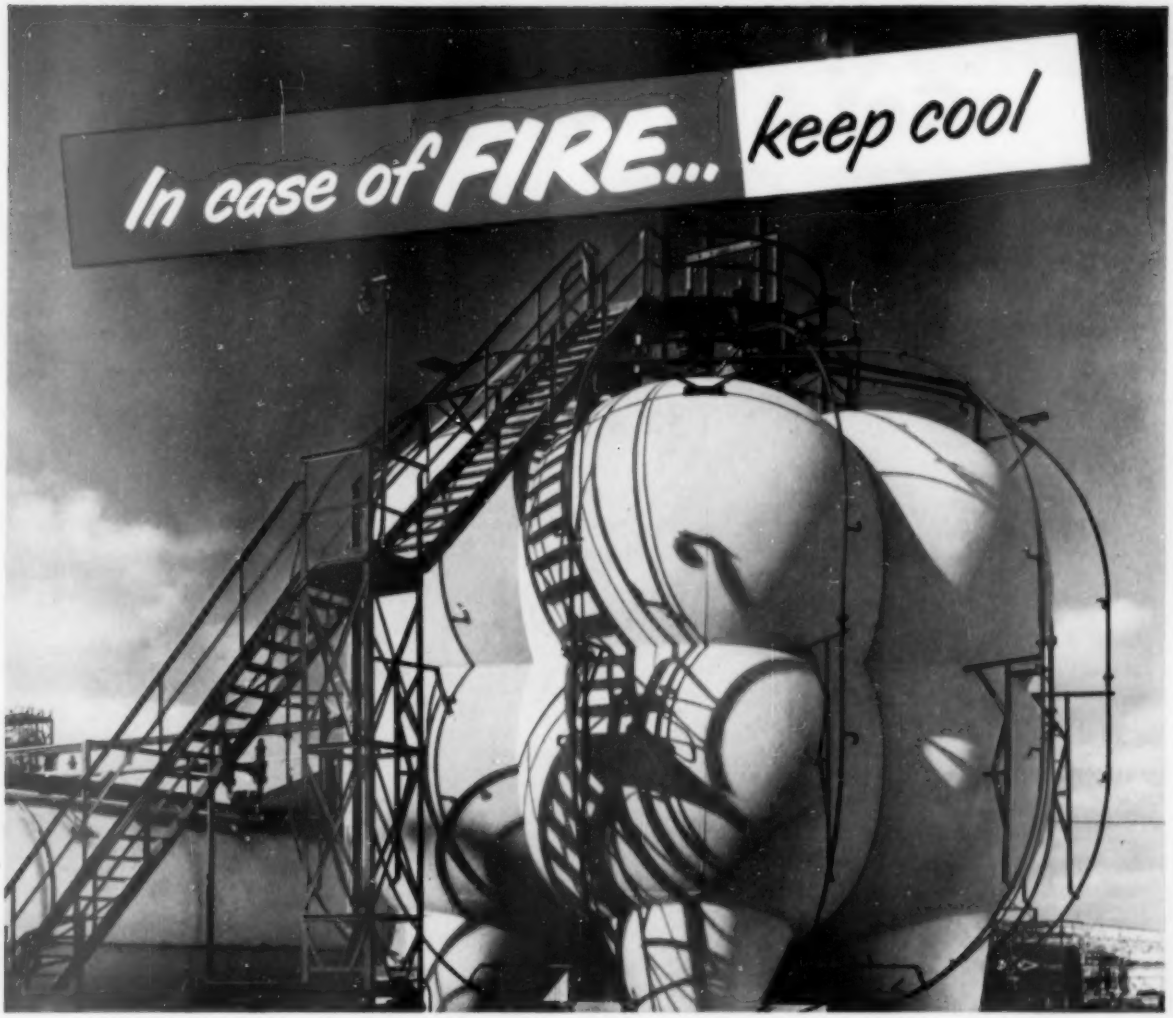

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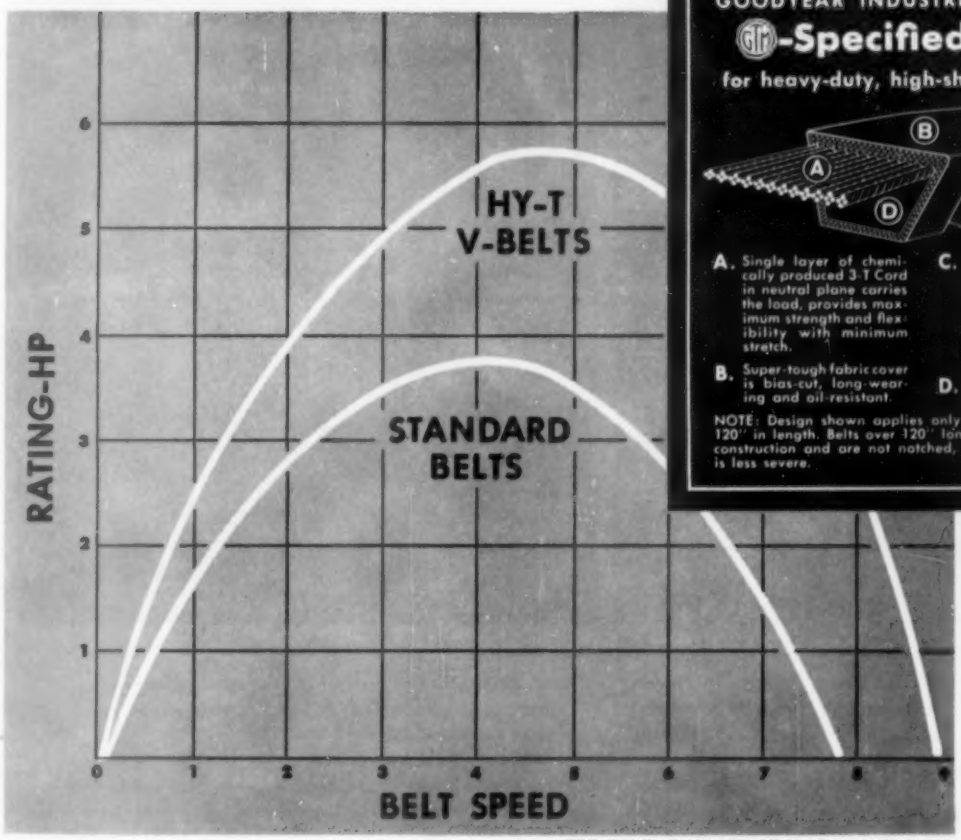

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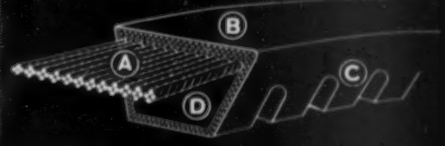

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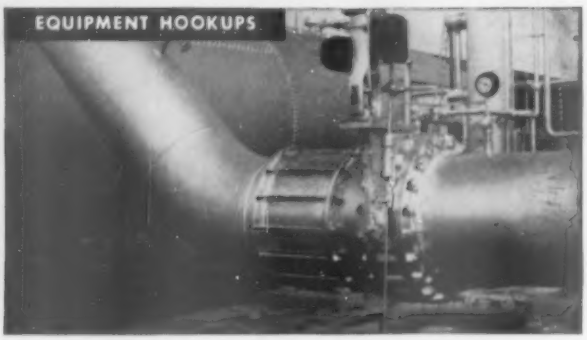

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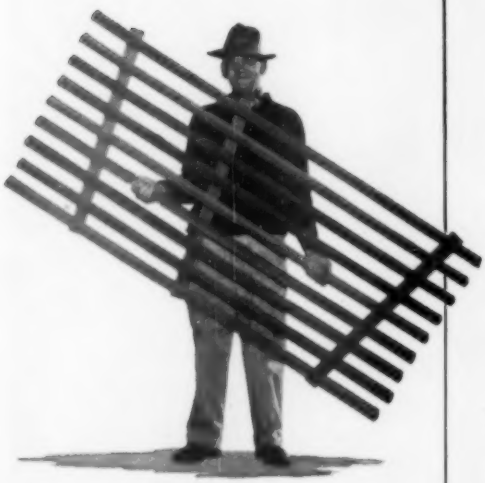
FLUOR COOLING TOWER
and get the whole story



Fluor uses only 100% clear all heart redwood for filling

Fluor grid decks are not only sturdily built but are made from the highest grade redwood lumber—100% clear all heart redwood—the finest cut of the log. Clear all heart redwood is free from defects and sapwood and under normal controlled water conditions will give many many years of trouble-free service. We invite you to investigate our filling before making your selection of a cooling tower.

On an average, the price of a cooling tower is based 30% on the mechanical equipment and about 70% for lumber and fabrication. For example, in a Cooling Tower costing $200,000, the mechanical equipment will amount to approximately $60,000 and the tower structure about $140,000. Of this $140,000 about 30% (or $42,000) consists of the filling (grid decks) inside the tower which breaks up the water for greater exposure to air.

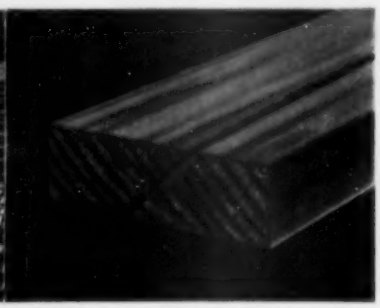
The filling is in reality the heart of the tower and its design and construction is of utmost importance. All Fluor Tower filling is mill cut and assembled into grid panels, 2 ft. 10" wide x 5 ft. 11½" long. Nine bars are nailed (with 6 penny copper nails) to three 1x2 cross cleats. The bars are cut on a 25% bevel from 1 x 3 boards; each bar averages 1" x 1½". Grid panels are strong enough to support three 200 lb. men and are actually used as scaffolding during tower erection and inspection. You get more years from a tower with this kind of filling.

Write for illustrated bulletin
"Cooling Water for Industry."

FOUNDER MEMBER
CTI
COOLING TOWER INSTITUTE

Grid decks easily support three 200 lb. men

Grid decks serve as scaffolding during erection



A 1x3 makes two bars for Fluor grid decks

BE SURE WITH

FLUOR

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA
FLUOR OF CANADA: TORONTO
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ENGINEERS
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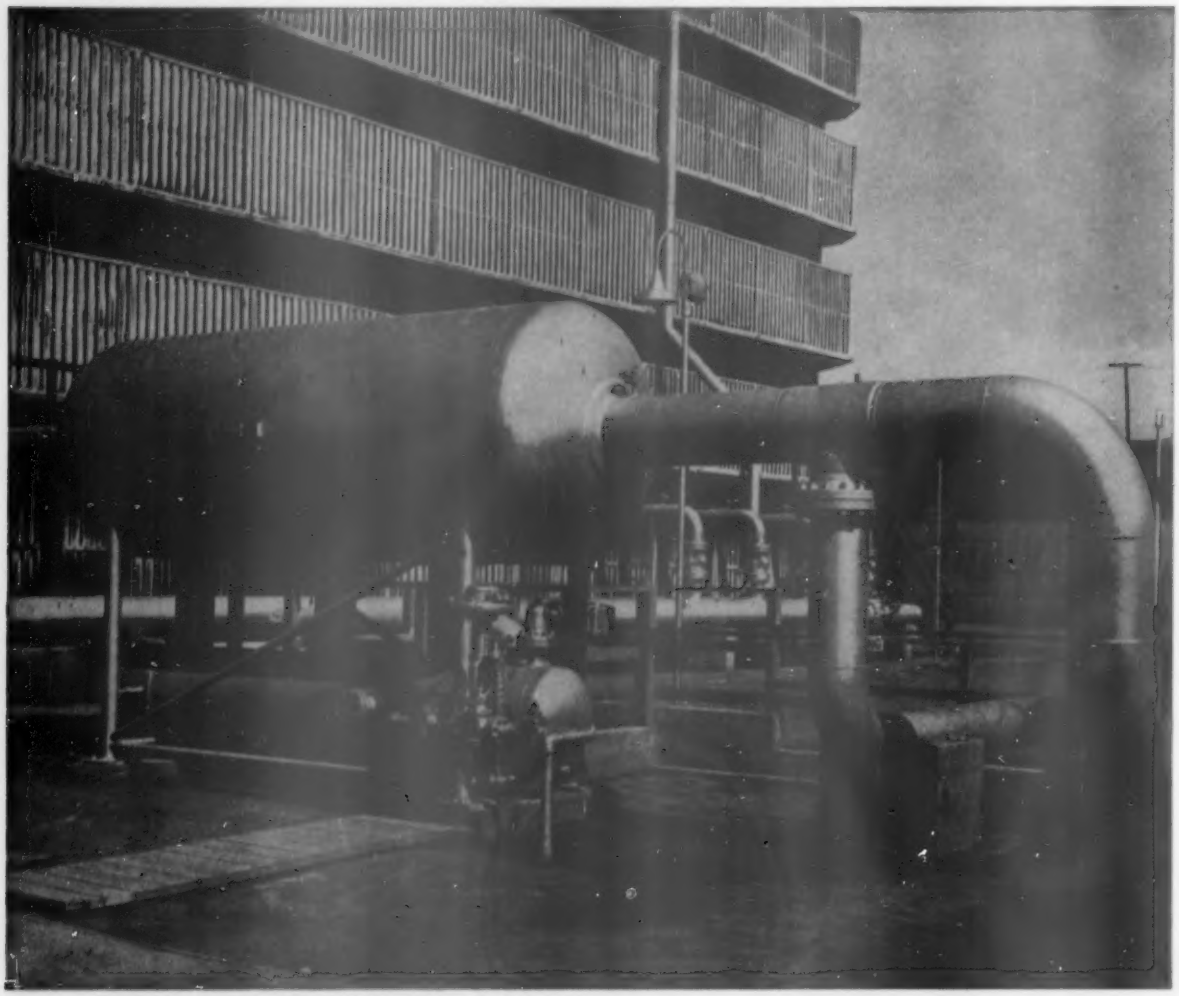
See PEERLESS FIRST!
For GAS SCRUBBERS...



The *BEST SCRUBBERS* for PIPELINES, GATHERING SYSTEMS, COMPRESSOR STATIONS, PLANT INLET SCRUBBERS

Pictured above is a Peerless 60" O.D. x 15 foot horizontal separator, handling 240,000,000 cu. ft. per day at 350#.

This separator is removing condensed liquid from the cooling tower to prevent moisture accumulation in distribution units.

Consult Peerless for an engineered solution to your most stringent entrainment problems.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 ★ DALLAS, TEXAS ★ Dixon-8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

OPEN OR RE-OPEN PLUGGED PAY ZONES

with

HALLIBURTON'S

MCA

DOUBLE ACTION MUD CLEANOUT AGENT

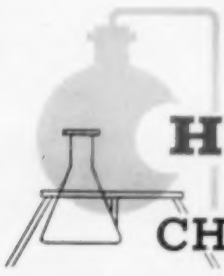
Both old and new wells get a production "shot in the arm" when choking emulsions and blocks are knocked out by the double action of MCA. This economical process has been proved highly effective for restoring normal permeability to old wells or to start new wells right with free flow from pay zones.

Only MCA has the double action required to remove aqueous and bentonitic blocks in both sand and limestone formations, because only MCA has the exclusive combination of hydrochloric acid and Morflo, a highly active surfactant developed by Halliburton researchers. It is this combination of effective agents that gives the double action needed to break blocks, release water, disperse solids and make it easy for clogging materials to be flushed away.

And you'll find MCA is economical and easy to use. Usual close in time is only one or two hours and clean up times are just as short. MCA can be applied through a production packer already in the well or through tubing with rods in place, open end tubing or a variety of well servicing tools and packers.

Why not ask your nearby Halliburton operator what MCA can do for the production of your well. With a past record of making profitable producers from new, low production wells and old, marginal pumpers—you are sure of getting the most effective cleaning agent known. Give MCA a try—and you give your well a chance to flow free in normal production!

Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

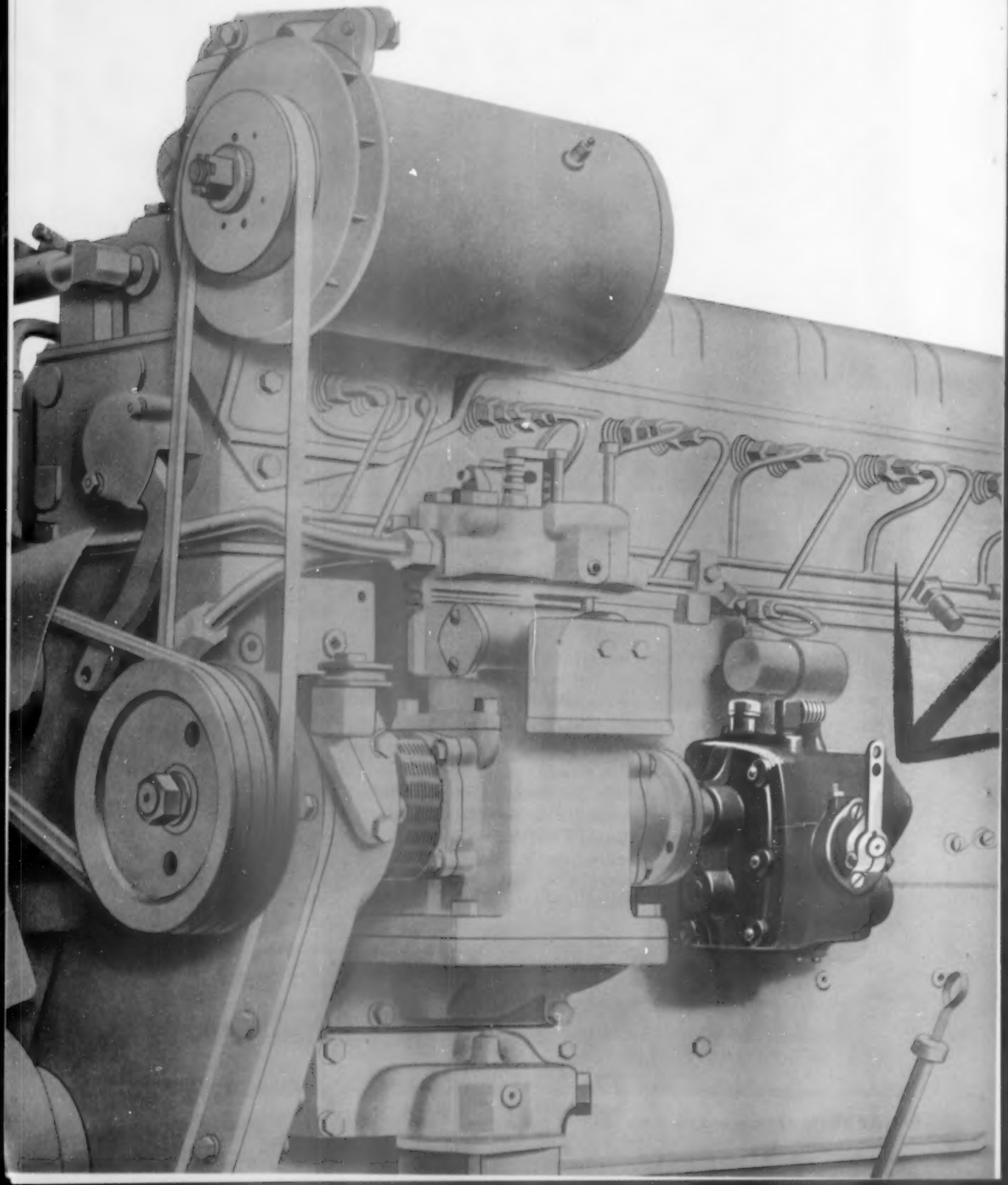


HALLIBURTON

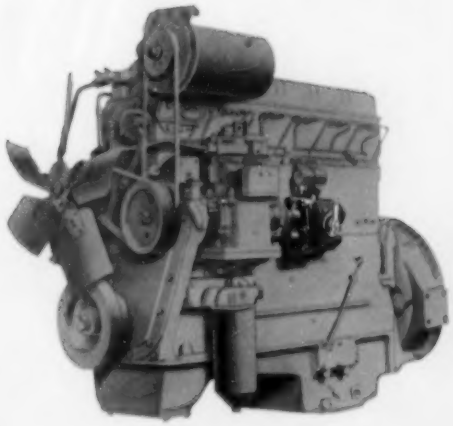
CHEMICAL SERVICES

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

Cummins new, exclusive diesel



fuel system needs no specialists!



PT Fuel System standard on all models...simpler to work with than gasoline carburetion and ignition

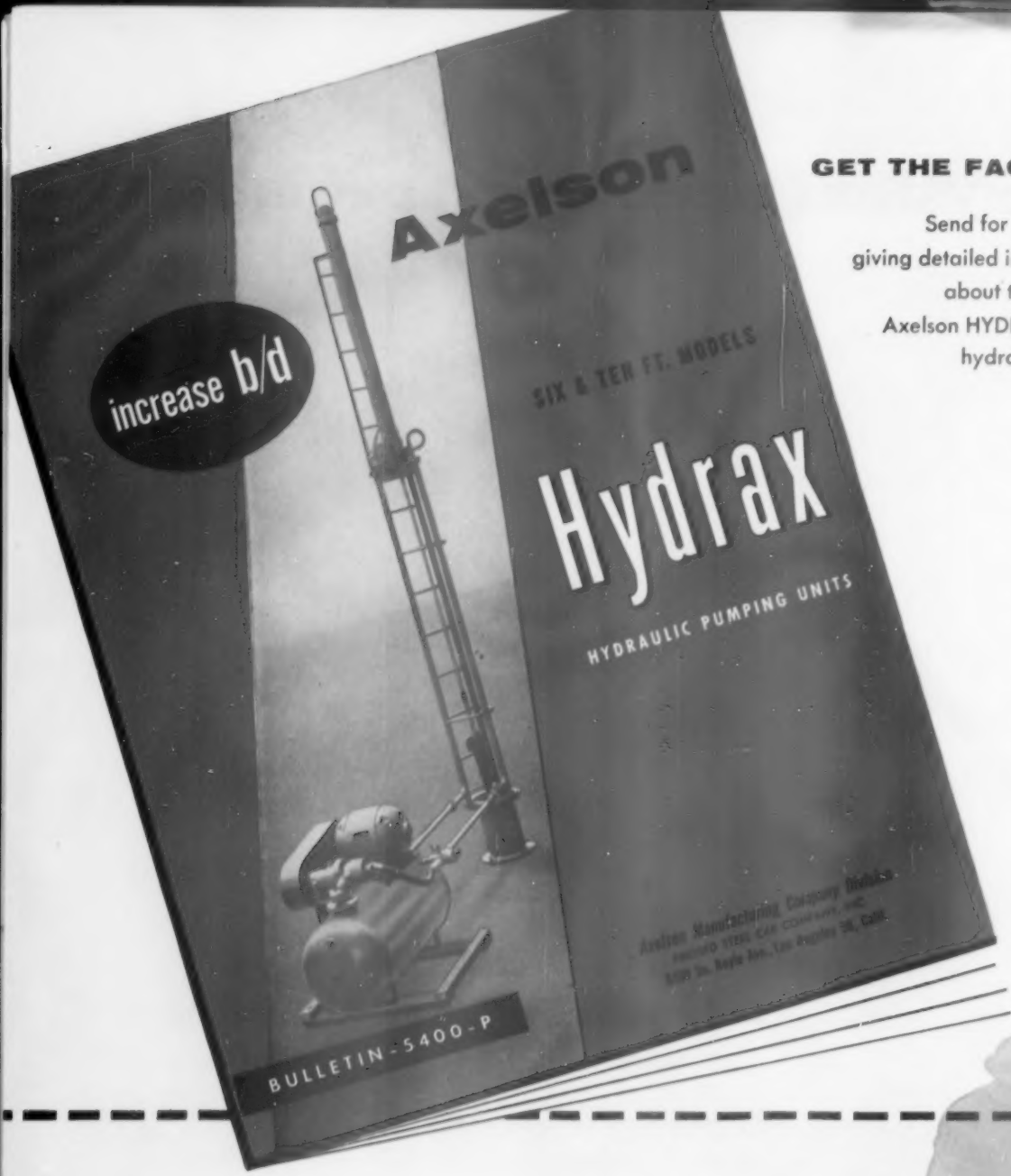
- Fuel system servicing costs become negligible.
- Compact pump weighs only 13 pounds—system has no fuel racks to adjust . . . no check valves, metering plungers,discs, or floats—pump not timed to engine.
- Fewer parts than any fuel system on any heavy-duty engine.
- Adaptable to all Cummins Diesels built since 1932.

Write for your copy of descriptive folder "Cummins PT Fuel System."

CUMMINS **Cummins**

Engine Company Inc., Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)



GET THE FACTS

Send for Bulletin No. 5400-P giving detailed information about the new Axelson HYDRAX hydraulic pumping units.

AXELSON MANUFACTURING COMPANY DIVISION
PRESSED STEEL CAR COMPANY, INC.
LOS ANGELES 58, NEW YORK 7, ST. LOUIS 14, TULSA 1

LATHES: ENGINE • TOOL ROOM • HOLLOW SPINDLE • GAP BED • AIRCRAFT COMPONENTS
IRON FOUNDRY PRODUCTS • PETROLEUM PUMPING EQUIPMENT

DAIRY & FARM EQUIPMENT • WASTE CONTAINERS • STAINLESS STEEL COOKWARE • CAR ACCESSORIES • TANKS • AGITATORS • SMOKE STACKS • DUST COLLECTORS • COAL & ASH HOPPERS • FITTINGS • ELECTRICAL ACCESSORIES • ORDNANCE MATERIEL • UNISHELTER RELOCATABLE HOMES • EXPORT ONLY: LOCOMOTIVES • TRACKWORK • CARS (MINE, ORE, CANE, INSPECTION) • UNISTRUT METAL FRAMING • WEED BURNERS • BRICK & TILE MACHINERY CRANE LOADERS

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

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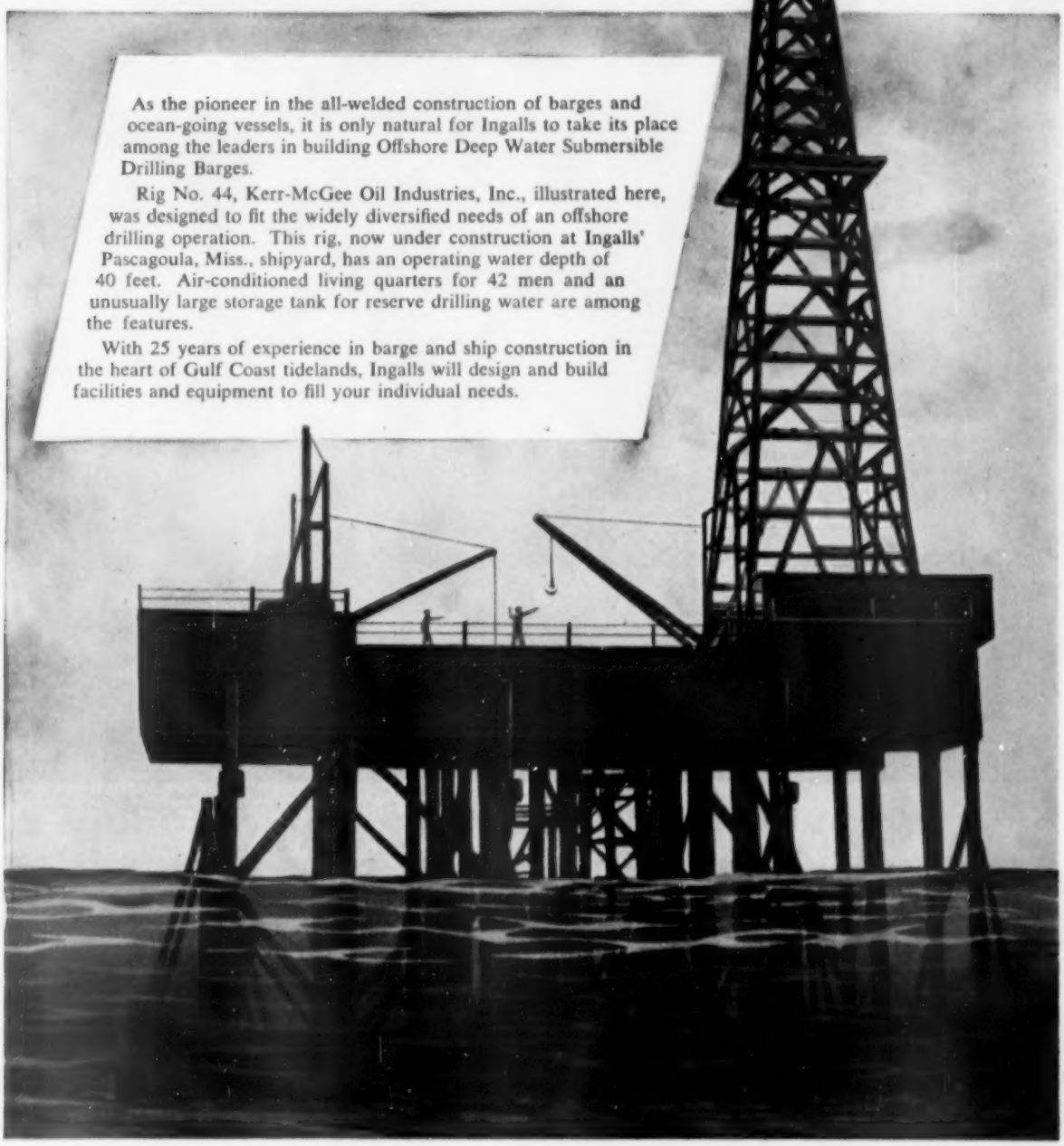
Oil Drills Get Sea Legs

As the pioneer in the all-welded construction of barges and ocean-going vessels, it is only natural for Ingalls to take its place among the leaders in building Offshore Deep Water Submersible Drilling Barges.

Rig No. 44, Kerr-McGee Oil Industries, Inc., illustrated here, was designed to fit the widely diversified needs of an offshore drilling operation. This rig, now under construction at Ingalls' Pascagoula, Miss., shipyard, has an operating water depth of 40 feet. Air-conditioned living quarters for 42 men and an unusually large storage tank for reserve drilling water are among the features.

With 25 years of experience in barge and ship construction in the heart of Gulf Coast tidelands, Ingalls will design and build facilities and equipment to fill your individual needs.



Artist's Conception of Rig No. 44

BUILDERS OF:

TANKERS • OIL BARGES
MARINE EQUIPMENT
OIL DRILLING BARGES
MARINE BULK STORAGE TANKS • OIL AND CHEMICAL STORAGE TANKS

THE INGALLS SHIPBUILDING CORPORATION

General Offices: Birmingham, Alabama, U.S.A.

Shipyards: Pascagoula, Mississippi — Decatur, Alabama

Branch Offices: New York, Pittsburgh, Chicago, Houston, Washington, D. C., New Orleans

"Featherweight" 85% Magnesia was installed on the ducts, housings and lines of these "making" machines in the plant of Behr-Manning Corporation, a division of Norton Company. Insulation contractor—Armstrong Cork Company.

Heat saved . . . Money saved with K&M high temperature insulations

K&M insulations keep costs down by holding heat losses to an absolute minimum. You can always count on dependable "Featherweight" 85% Magnesia Insulation to provide exceptionally efficient heat conservation.

Made of 85% basic carbonate of Magnesia and asbestos fiber, "Featherweight" 85% Magnesia effectively insulates piping and equipment with temperatures up to 600°F. Used with K&M Hy-Temp insulation, its range is extended to 1900°F. This insulation combination lasts the life of the equipment it serves, withstands moisture, vibration and frequent temperature change.

New and now available is "Featherweight" Water-Resistant Magnesia insulation for temperatures up to 450°F. It is used underground where severe water exposure may damage the insulation or on indoor steam heated lines and equipment where high humidity and moisture are present.

Your K&M distributor is an experienced applicator who will gladly give you details about these money-saving insulations. Or write directly to us.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

K&M Last in asbestos ®

"First in supply service" means

a million miles every month on the road!

Oil country miles are usually long ones, but every trip is just part of the day's job for the men in the National Blue cars. Working out of the National Supply Stores in their area, they know well the many roads they travel to regularly keep in touch with customers and promptly service their needs.

Every month, hundreds of National field service representatives average a total of more than a million miles on the road . . . over the sands of Texas, through mud in Illinois and snow in Calgary. Wherever you go in the oil country, you'll see them, giving special advice and help wherever and whenever it's needed.

Your continued satisfaction with their services, and the network of completely-stocked stores which they represent, keeps us the world's largest oil country supply organization. Being "first in supply service," as well as first in equipment quality, has been tradition for over half a century. The man in the National Blue car can tell you.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE
NATIONAL SUPPLY
COMPANY
PITTSBURGH 30, PENNSYLVANIA

Why **NATIONAL PUMPING UNITS**
can meet your most exacting needs...

More than 20,000 National Pumpers have been put into service to meet the most exacting needs of oil men everywhere. Here's why:

1. They are ruggedly built and precision-engineered

Jig-welded construction, reinforced at all points of extreme stress, assures ample strength. Precision engineering provides for positive alignment and interchangeability of all component parts.

2. They are easy to assemble and adjust

The simple, compact design of National Pumping Units makes possible easy field assembly. Every component section, from main base to walking beam, has adjustment features which guarantee true alignment to the well. Counterweights are designed for easy, safe adjustment by one man at ground level (see opposite page).

3. They cost less to operate and maintain

Needle type anti-friction saddle and pitman bearings, self-aligning wrist pin bearings and pressure relief valves to prevent over-lubrication are typical of the many quality features which provide for efficient, low-cost operation. Because National Pumpers are individually engineered to perform dependably under specific load requirements, they require a minimum amount of maintenance.

4. They are exceptionally long-lived

National Pumpers have an outstanding reputation for giving long, non-stop service under all conditions. The extra stamina built into them provides for smooth operation—even when depth ratings are exceeded.

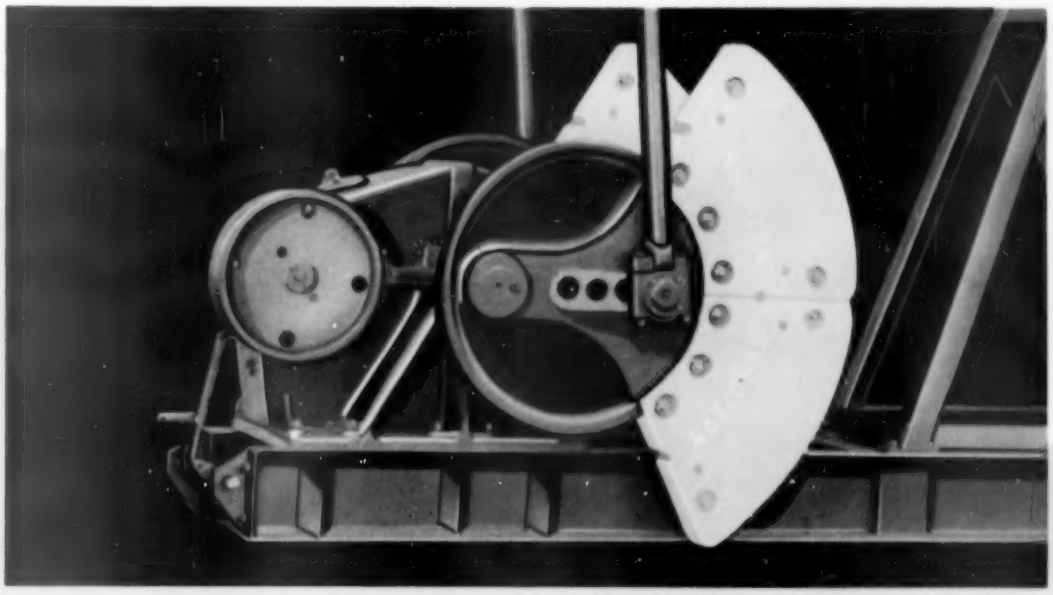
5. There is a model to economically suit every load and field condition

National's complete line of pumping units ranges from a 3,200 pound API rated walking beam unit to a 32,400 pound API rated walking beam model.

A total of **38 combinations,** in beam and crank counter weighted types, are available, and you can easily select the exact unit to best handle each job.

Facts and figures on the unit that's best for your well are readily obtainable from the National Supply Representative in your area. Why not let him show you how it pays to standardize on National Pumping Units.

National gear reducers, precision-built in single and double reduction types, are run-in under load at the factory to assure quiet and efficient operation in the field. All moving parts are cascade lubricated, and all extended shafts have weather-tight oil seals. Sediment chambers in gear cases can be quickly cleaned by means of easily accessible magnetic drain plugs.



Reduced power consumption and minimum stress on the unit and rods are made possible with National's patented eccentric type disc crank. With its rim-locked counterweights, it is safely and easily adjustable by one man at ground level. The weights slide around the track to any desired position, allowing the very maximum in accuracy of counterweight effect and degree of lag and lead.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

DIVISION OFFICES: Denver, Ft. Worth, Houston, Pittsburg, Tulsa, Torrance

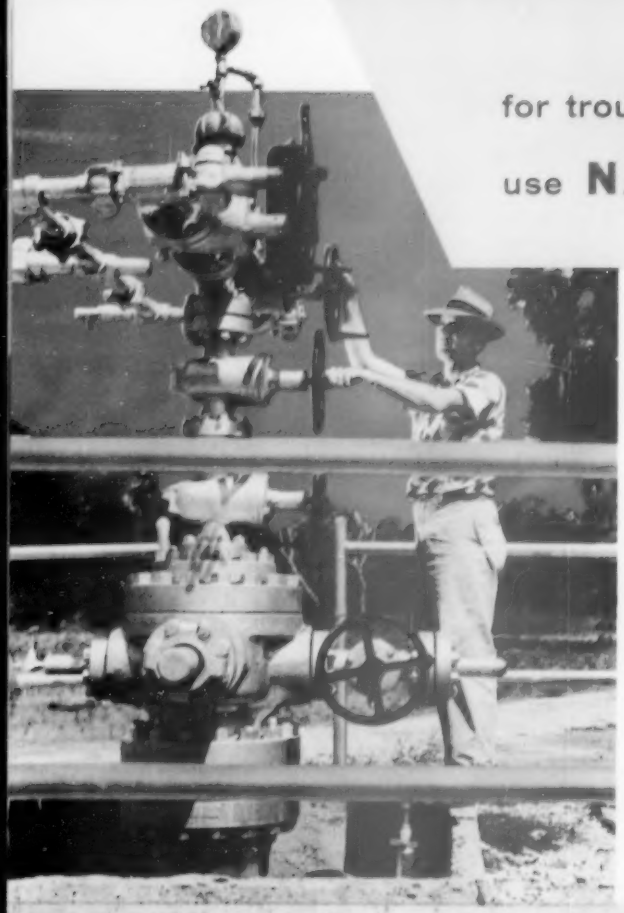
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta

EXPORT: 600 Fifth Avenue, New York 20, N. Y., U. S. A.; Swan Plate House, 72 South Place, London E. C. 2

for more information on profitable production, see the next page

for trouble-free recovery by any method,

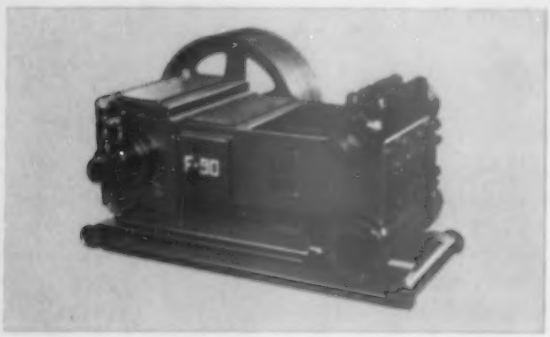
use **NATIONAL** PRODUCTION EQUIPMENT



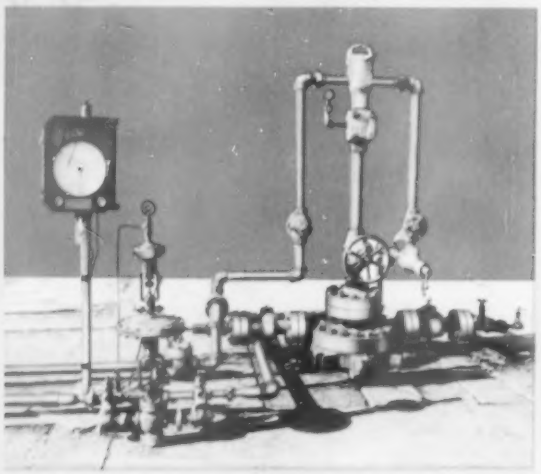
You'll find it worthwhile to get *all* the facts on National Production Equipment for primary and secondary operations. You can get product bulletins and any other information you may require at the nearby National Supply Store.

NATIONAL SUCKER RODS are precision-manufactured in various grades to meet every load and well condition. They are engineered for maximum resistance to shock, corrosion, fatigue and impulse loads.

NATIONAL WELLHEAD EQUIPMENT has interchangeable units which provide a multitude of combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two more outstanding features of this equipment.



NATIONAL TRIPLEX PUMPS provide maximum volume and injection pressures for today's waterflood projects. Available in several h.p. ratings, they are also usable for salt water disposal, oil gathering, or as power-oil sources for sub-surface hydraulic pumping.



NATIONAL'S IDEAL PLUNGER LIFT uses formation pressure for economically producing wells where reservoir conditions are suitable. For these certain types of wells, Ideal Plunger Lift can be the best production method to use.

First in quality
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE **NATIONAL SUPPLY** COMPANY

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DIVISION OFFICES: Denver; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance

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• • • FOR VENT LINES ON OIL AND GAS SEPARATORS

Fisher Series 63 Back Pressure Regulators are used where pilot control, stable regulation, and tight shut-off are required.

The main valve assembly is pressure loaded by the pilot valve. The pilot consists of a connected double diaphragm assembly, two springs and a 3-way valve.

If upstream pressure increases above the pilot spring setting, the pressure under the lower diaphragm pushes up on the diaphragm assembly, closing the supply port and opening the exhaust port. This bleeds pressure off of the main diaphragm allowing the unbalance pressure to open the main valve until the pilot is again in equilibrium. If the upstream pressure decreases, the reverse is true, with pressure building up above the main diaphragm tending to close the main valve.

The back pressure range may be set anywhere from 10 lb. to 125 lb. by simply turning the adjusting screw in the pilot spring case.

Features

1. **Absolute tight shut-off.**
2. **Accurate and stable control.**
3. **Full line orifice permits maximum capacity.**
4. **Non-bleed type of pilot.**
5. **Teflon stem seal eliminates lubrication and reduces friction, contamination and attention.**

FISHER GOVERNOR COMPANY • Marshalltown, Iowa

Vinyl coating users agree . . .

YOU GET MORE MILS PER GALLON WITH AMERCOAT 33

Amercoat's higher solids content gives you a thicker, heavier coating—more mils for every gallon applied.

THIS MEANS YOU SAVE MONEY TWO WAYS ON MAINTENANCE PAINTING

Lower Material Cost. You save on material because it takes fewer coats of AMERCOAT 33 to build the required film thickness.

Lower Labor Cost. You save on labor because fewer coats mean fewer man hours for application—less down time, too.

In addition to more mil thickness per gallon, you get more protection per gallon. AMERCOAT 33 is formulated specifically for maximum chemical resistance and for severe weathering conditions. In major industries from coast to coast — chemical, petroleum, pulp and paper, food, and many others — maintenance engineers look to AMERCOAT 33 for low cost, long lasting protection for all types of steel or concrete structures.

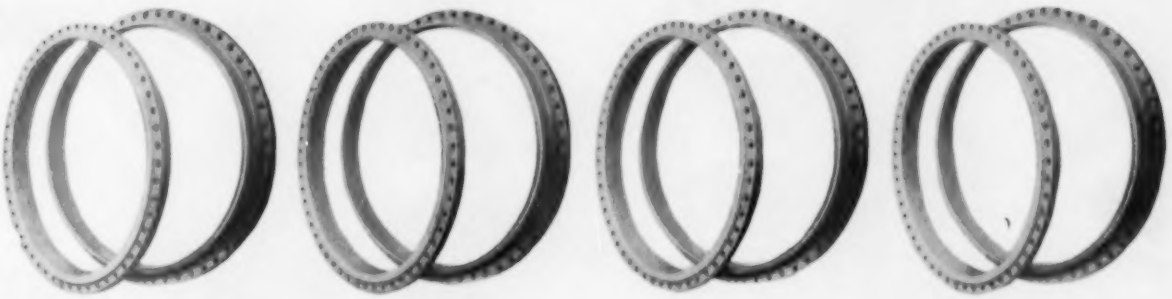
Amercoat pioneered the development of protective coatings especially designed for severe corrosion problems. Today it is the only organization that offers you... a complete line of corrosion resistant coatings...nationwide distribution... trained technical men to give you on-the-job assistance throughout the United States and Canada.

Amercoat **CORPORATION**
Dept. C
4809 Firestone Blvd.,
South Gate, California

CHICAGO, ILL. • KENILWORTH, N. J. • JACKSON, ILLE, FLA. • HOUSTON, TEX.

Write today for the AMERCOAT 33 Technical Bulletin which gives a complete description of the coating's chemical and physical properties.

life savers for your plant



"railway" steel flanges . . . large diameters

high-quality carbon or alloy steels . . . from 18 in. ID to 150 in. OD

Railway Steel Flanges

RAILWAY STEEL-SPRING DIVISION
AMERICAN LOCOMOTIVE COMPANY

Chicago • Cleveland • Houston • New York • Richmond • San Francisco • St. Louis • St. Paul • Tulsa*
*Ardun Supply Company

KOEHRING
3/4-Yard

HOE digs 19¾-feet below grade

Combining long, deep reach with heavy-duty digging strength, this Koehring ¾-yard hoe delivers big-yardage output on pipeline trenches, footings, slush pits and other below-grade excavations. It reaches a long way down, 19 feet-9 inches below crawlers . . . comes up with a full load every pass, in any kind of dirt or rock. There are 3 settings on the dipper arm . . . cutting angle is easily changed to best suit digging conditions and type of cut. Big ¾-yard dipper makes a wide cut . . . 40 inches over side-cutters.

During the dig-and-swing cycle, close-coupled dipper pulls up tight to boom, avoids spillage as boom is raised. Long reach lets hoe dump far beyond edge of cut . . . or gives up to 12½-foot clearance height (at beginning of dump) to load into trucks.

For all its powerful, fast action, this Koehring heavy-duty hoe gives you exceptional ease of operation. It has a mechanical booster clutch that requires only ⅓ to ½ the lever pull of a straight manual clutch . . . yet retains accurate "feel" of load.

Full operating efficiency is maintained at all times, because Koehring 304 main clutches are equipped with heat compensator springs that make tension changes automatically. Saves time . . . pays off in improved control and extra production with every 304 attachment. Interchangeable shovel, dragline, clamshell, pile driver and crane extend the 304's big work capacity to all your excavating and lifting jobs.

As a crawler crane, this Koehring 304 has 13.9-ton lift capacity. On rubber-tired truck or cruiser mounting, it safely lifts up to 25 tons.

Look into its many other production-boosting advantages. See your Koehring distributor, or write for 304 bulletin.

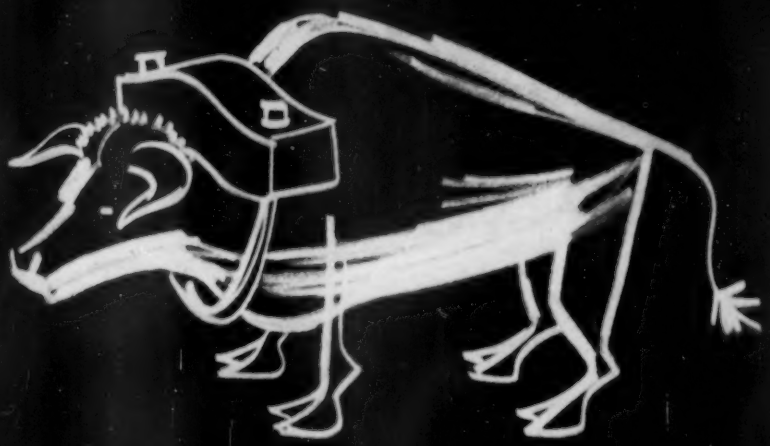
KOEHRING COMPANY, Milwaukee 16, Wisconsin

(Subsidiaries: Kwik-Mix • Parsons • Johnson)

X479

EXCAVATORS ½ to 2½ YDS. • CRANES up to 79½ TONS

WHEN YOUR CHAIN MUST BE STRONG AS AN



CHOOSE REX ROLLER CHAIN*

DESIGNED FOR STRENGTH, THEY ARE PRECISION MADE OF CARBON ALLOY STEEL WITH HEAT-TREATED ROLLERS.

CHAIN BELT COMPANY

ROLLER CHAIN DIVISION
357 PLAINFIELD STREET
SPRINGFIELD 2, MASS.

* WE'VE CHANGED OUR NAME... but the chain's the same. Baldwin-Rex Roller Chain is now called Rex Roller Chain and the Baldwin-Duckworth Division is now known as the Roller Chain Division of Chain Belt Company.

Ansul

is the only dry chemical fire extinguisher backed by a five year warranty!

Here is proof of Ansul's superiority . . . *a five year equipment warranty*, the only one of its kind in the fire control industry.

For the buyer of fire equipment this important warranty means many *extra* years of trouble-free protection plus freedom from costly and frequent maintenance checks and repairs.

The special design and construction features that make this warranty possible provide not only dependable protection but also *fast, effective* fire control. Ansul's *weather-tight* construction keeps out moisture and resists corrosion. *Patented nozzles* deliver the right kind of stream for your fire protection problem. The *sealed pressure cartridge* puts Ansul's "Plus Fifty" dry chemical to work immediately—no delay or lag. And finally *rugged construction* makes it possible for Ansul equipment to give peak performance under the toughest operating conditions.

HERE IS THE BIG TRAINING AND SERVICE PLUS OFFERED ONLY BY ANSUL!

Available without cost to all Ansul users.

Training for your personnel at your plant by Ansul specialists.

Customer training school at Marinette for your key safety personnel.

Visual aids on fire control for your safety meetings and other training.

In-plant survey to scientifically determine your fire protection needs.

Call the Ansul Man!

ANSUL

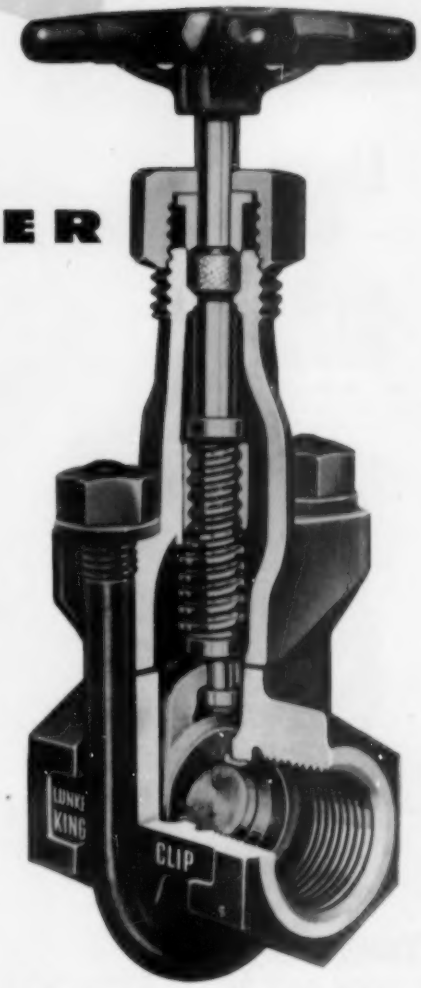
Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Div., Dept. F-93, Marinette, Wisconsin.

Tightest gate valve . . . . . you ever used!

the original clip valve with the NEW **non-slip®** *handwheel**

King-clip®

by **LUNKENHEIMER**



It closes tight . . . it stays tight . . . and here are four good reasons why:

The new Non-Slip Handwheel provides a firmer, more comfortable grip for closing — even when the operator's hands are wet or greasy.

The body provides unusual ruggedness — protects the valve against distortion from wrenching or pipe stresses . . . and the steel clip permits quick disassembly and reassembly.

Extra thread length prevents pipe ends from jamming against diaphragm or seat rings to force them out of line. Threads accommodate both A. P. I. and standard threaded pipe.

Stemalloy* stems, in the Iron Body Bronze Mounted patterns, have amazing resistance to thread wear. Millions are in use, and *not one* has ever been returned due to wear failure.

LUNKENHEIMER
QUALITY

BRONZE · IRON · STEEL

Ask your Lunkenheimer Distributor about "King-clip" — the original Lunkenheimer clip valve with cast-in drain channels and a bonnet-thread bushing for perfect stem alignment. For full details, request Circular 561 from your distributor or The Lunkenheimer Company, Box 360F, Cincinnati 14, Ohio.

*Patented

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-753-4

CONDULETS* are ... they're made right

Type LB
Obround Condulet

Type FS Threaded,
With Pilot Lamp Receptacle,
Switch, and Plug Receptacle

Type EPC Explosion-Proof
Motor Starter and
Circuit Breaker
Condulet

Six-spindle automatic screw machine performs six operations simultaneously — makes dozens of hub reducers or conduit union parts every minute.

Crouse-Hinds modern methods produce a superior product . . . to serve you better

Crouse-Hinds factory is equipped with the finest modern machinery, designed for fast, accurate production. To turn out the quality work of which they are capable, such machines require expert handling. Crouse-Hinds machinists have the skill that can come only from long years of careful workmanship. A high percentage have more than twenty-five years of loyal service to their credit. These highly trained machine operators are producing a superior product . . . to serve you better.

More than 15,000 types and sizes of Condulets are listed in the Condulet Catalog . . . a type for every purpose in hazardous and non-hazardous locations.

Always specify Condulets and get the benefit of Crouse-Hinds quality on every job.

When quality counts . . . you can count on Condulets*

*CONDULETS are made only by CROUSE-HINDS

CONDULET
First in the field
STANDARD OF QUALITY

A Nationwide Distribution Through Electrical Distributors

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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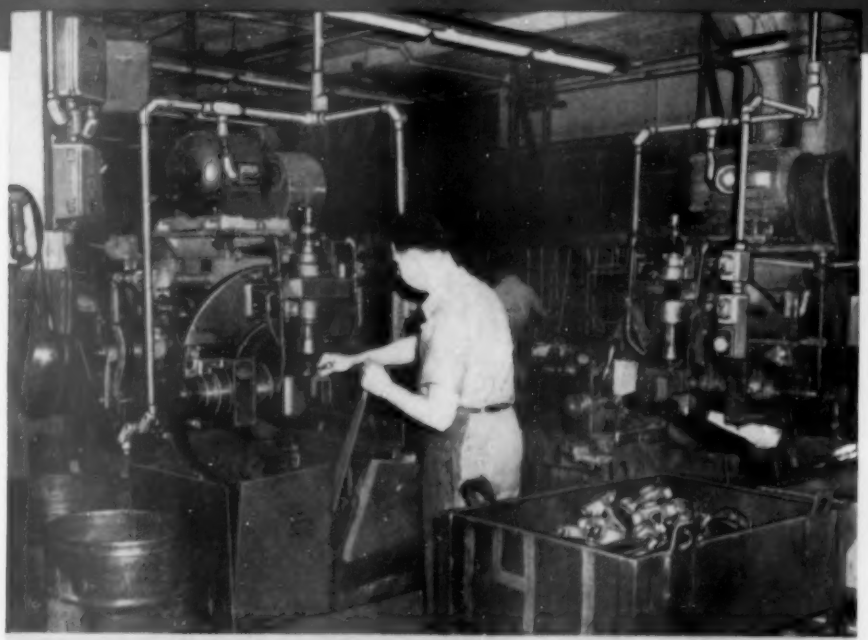
CONDULETS · TRAFFIC SIGNALS ·

tops in quality to last longer



One machinist operates two semi-automatic tapping machines, each of which threads four Condulet hubs simultaneously to insure perfect alignment of the final conduit installation.

Pneumatic wrench is adjusted to provide exactly right amount of torque to fasten globes rapidly and securely into globe holders for explosion-proof lighting fixtures.

Type EVA Explosion-Proof Lighting Fixture

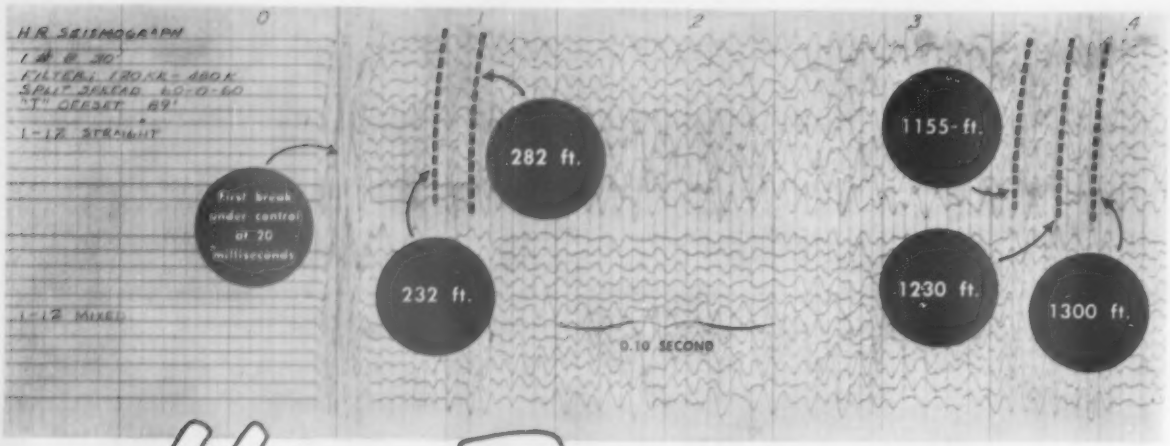
Type FLF Explosion-Proof Manual Motor Starting Switch Condulet

Type ARE Plug Receptacle With Spring Door

Type LBH Explosion-Proof Condulet For Pulling Cable

Type GUAC Explosion-Proof Junction Condulet

FLOODLIGHTS · AIRPORT LIGHTING



High Resolution

here's a new record for near-surface seismic data

If you're plagued with the problem of obtaining accurate near-surface seismic data, look carefully at the record illustrated here. With first breaks under control in 20 milliseconds, a reliable reflection was obtained at a depth of 232 feet. This record is typical of the results obtained by the new Houston Technical Laboratories High Resolution Seismic System. A major development in geophysical prospecting, the HTL portable HR System now makes possible reliable reflection surveys over a depth range of 100-2500 feet. It is especially designed for use in petroleum exploration, mining, ground water location, and civil engineering where shallow seismic information is vital.

WRITE for Technical Bulletin No. S-303 for additional information about how you can now make reliable *shallow reflection* surveys.

use the HTL portable HR seismic system to:

- establish near-surface velocity control
- obtain near-surface structural data
- supplement core-hole information

HTL

HOUSTON TECHNICAL LABORATORIES

A SUBSIDIARY OF TEXAS INSTRUMENTS INCORPORATED

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LOOK INTO ROCKWELL "201"

ORIFICE METERS

FORGED STEEL MANOMETER ASSEMBLY.
EQUI-ANGULAR DIFFERENTIAL LINKAGE.
DIFFERENTIAL ADJUSTING SCALE.
TONGUE AND GROOVE GASKET SEAT.
STAINLESS STEEL DIFFERENTIAL MECHANISM.
POSITIVE SEATING OVERRANGE CHECK VALVE
PRECISION BORED LACQUER FINISHED MERCURY CHAMBER.
MACHINED FLAT TO CHECK MANOMETER LEVEL.
CHAMBER UNION PERMITTING INTERCHANGEABLE DIFFERENTIAL RANGES.
BALL TYPE IMMERSED UNDERRANGE CHECK VALVE.
ACCESSIBLE STANDARDIZED CAP SCREWS REQUIRING BUT ONE WRENCH.
EQUI-FLOW DAMPENING VALVE.
NEEDLE POINT DRAIN SCREW.

Better

Design and Materials
Readily Adaptable
Easy To Maintain

You are looking at a sectional rear view of the better designed Rockwell "201." Note the lavish use of highest grade materials, the ease of disassembly for servicing, the ready adaptability for interchanging high side chambers. Now, consider the money saving, money earning advantages of using Rockwell "201" orifice meters on all your lines. Full details are given in bulletin 1050. Write for your copy today.

THE ROCKWELL INTEGRATOR

The office companion to all your orifice meters. Accurately computes the total extension of charts by simply tracing the static and differential records as recorded by the meters. One integrator, with operator, can handle up to 300 average charts per day. Write for Bulletin 1016.

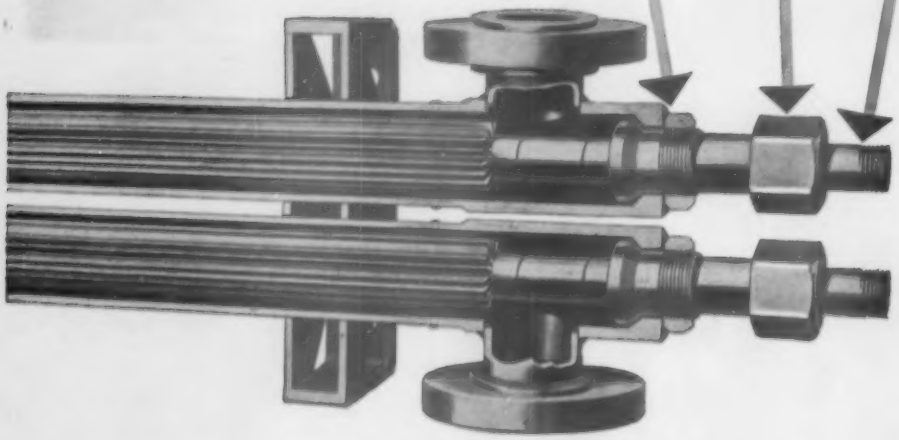
YOU CAN RELY ON ROCKWELL

ROCKWELL MANUFACTURING COMPANY PITTSBURGH 8, PA.

Atlanta Boston Chicago Dallas Houston Kansas City, Mo. Los Angeles New York
Philadelphia Pittsburgh San Francisco Seattle Tulsa

Simple as A B C

to assemble the head of this finned tube heat exchanger



THE G-R TWIN G-FIN® SECTION

A CONE PLUG LOCK NUT

B UNION NUT

C MALE TAILPIECE

These are the only parts in the complete head assembly of the G-R Twin G-Fin Section. Similar simplicity is inherent in every other feature, such as:

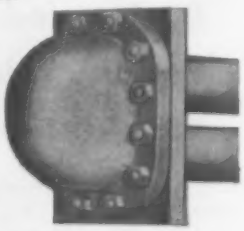
Simple Design—Consists essentially of a pipe within a pipe, without the complications of tube sheets, baffles and internal joints.

Simple Installation—These lightweight, standard, interchangeable units can be easily stacked and connected in series or parallel for the desired capacity and temperature ranges.

Simple Maintenance—Removable elements simplify cleaning of exteriors. There are no stuffing boxes to cause trouble, no rolled tube joints. Maintenance is low.

Simple Conversion—These units can be readily converted from one service to another. They are available in non-ferrous as well as ferrous alloys — can be used as heaters, coolers, condensers or heat exchangers for practically all liquids, vapors and gases.

Domed Shell Cover—This type of shell cover is particularly rugged, yet weighs only 17 pounds for the small sections and 43 pounds for the standard high capacity sections.



70,000 Trouble-Free Installations

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

G-R HEAT TRANSFER APPARATUS **Twin G-Fin Section**

GR-327

When you buy welding elbows . . .

Why take less when you can get more?

ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

★ They save pipe.

★ They often eliminate short nipples and their extra welds.

★ They save time and money in lining up and clamping pipe and fitting.

★ They make it easier to apply slip-on flanges.

★ They remove the circumferential weld from point of maximum stress and can be sleeved.

★ THEY COST NO MORE THAN OTHER ELBOWS.

As shown in the illustration above, Midwest "Long Tangent" welding Elbows have straight ends equal to ¼ of the nominal fitting diameter (a 12" elbow has tangents 3" long). For the reasons listed at the left, substantial savings are made on many piping systems by using Midwest "Long Tangent" Elbows. For more information about them, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic, Los Angeles and Boston

Sales Offices:

New York 7—50 Church St. • Chicago 3—79 West Monroe St.
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MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

Interesting "Quickie" on IDECO SHORTY BLOCKS

The IDECO Shorty unitized with hook reduces over-all length by as much as 9 feet.

Automatic safety lock makes it impossible to open the hook under any load — even the weight of the swivel bail. When all weight is removed and the lock released, the hinged portion of the hook drops open in perfect position to guide the swivel bail into place.

Swiveling link and hook lock in any one of eight positions by means of a reach bar from the derrick floor.

Hydraulic shock absorber (patented) in spring-loaded hook provides smooth stops and guards against shock loading.

Equipped with perfectly balanced IDECO Fabriform sheaves, with hub, web and rim of alloy steel. Mounted on double row of Timken tapered bearings.

Hinged sheave guards open wide to permit fast reeving.

Shorty blocks can be had with clevis only if preferred. Clevis can be replaced at any time with unitized assembly, simply by removing the pins which hold the clevis.

Phone your J & L store or write us at Tulsa for new bulletin on IDECO Shorty Blocks.

100 TON
160 TON
260 TON
400 TON

J&L STEEL

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION — TULSA, OKLAHOMA
Serving The United States and Canada

P·E·S·A
PARTNERS IN PETROLEUM PROGRESS

Trim costs with this hook-up for valve-killing corrosive services

To end high valve mortality from most corrosive liquids, and to control fluids that must be kept free from contamination or discoloration, stainless steel is the right metal. But it takes more than metal to make a valve. For dependable performance, you need the two-way hookup — Stainless Steel *and* Jenkins time-proved Valve Engineering.

With the increased demand for processing equipment that resists corrosion, more and more Stainless Steel Valves have been added to the Jenkins line. It now includes types, designs, sizes and alloys to meet practically all industrial needs.

Let the famous Diamond trade-mark be your guide when you choose valves of stainless steel. As on *any* Jenkins Valve, it means *extra value* . . . longer, trouble-free service life.

NEW BOOKLET describes the wide range of types, sizes, pressures, and alloys available in Jenkins Stainless Steel Valves, with diagrams and dimensions. Includes description of alloys, helpful information on selection, and survey forms. Ask for Form 200. Jenkins Bros., 100 Park Ave., New York 17.

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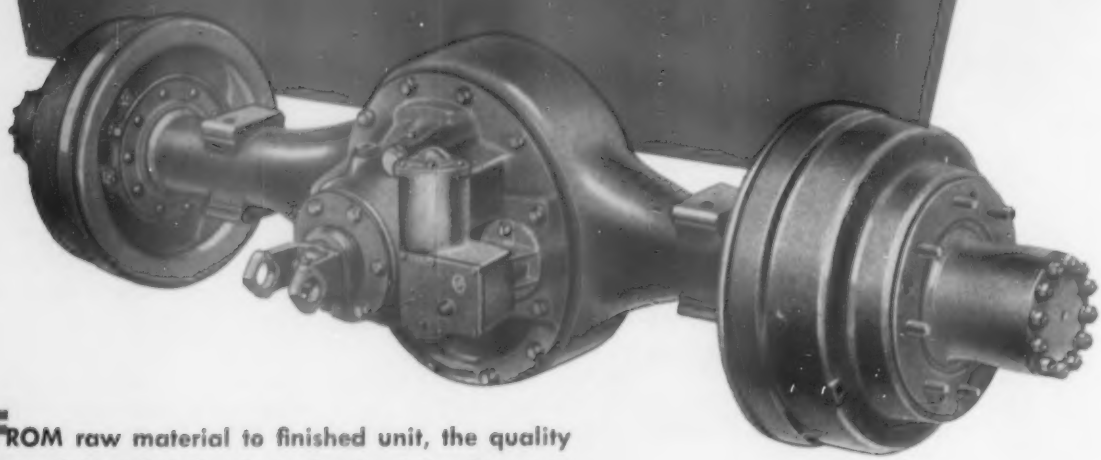
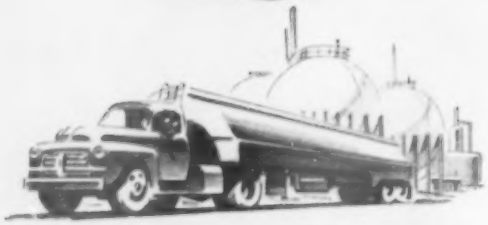
Superior Quality and Exclusive Features shrink hauling costs



FROM raw material to finished unit, the quality of Eaton 2-Speed Axles is maintained by the most advanced control procedures. Strict adherence to exacting quality standards, plus Eaton's planetary gear design, exclusive forced-flow lubricating system, positive shift control, and extra rugged construction combine to keep Eaton 2-Speed Axles on the job, out of the repair shop. They mean extra thousands of trouble-free miles—greatest possible vehicle utility at lowest possible cost.



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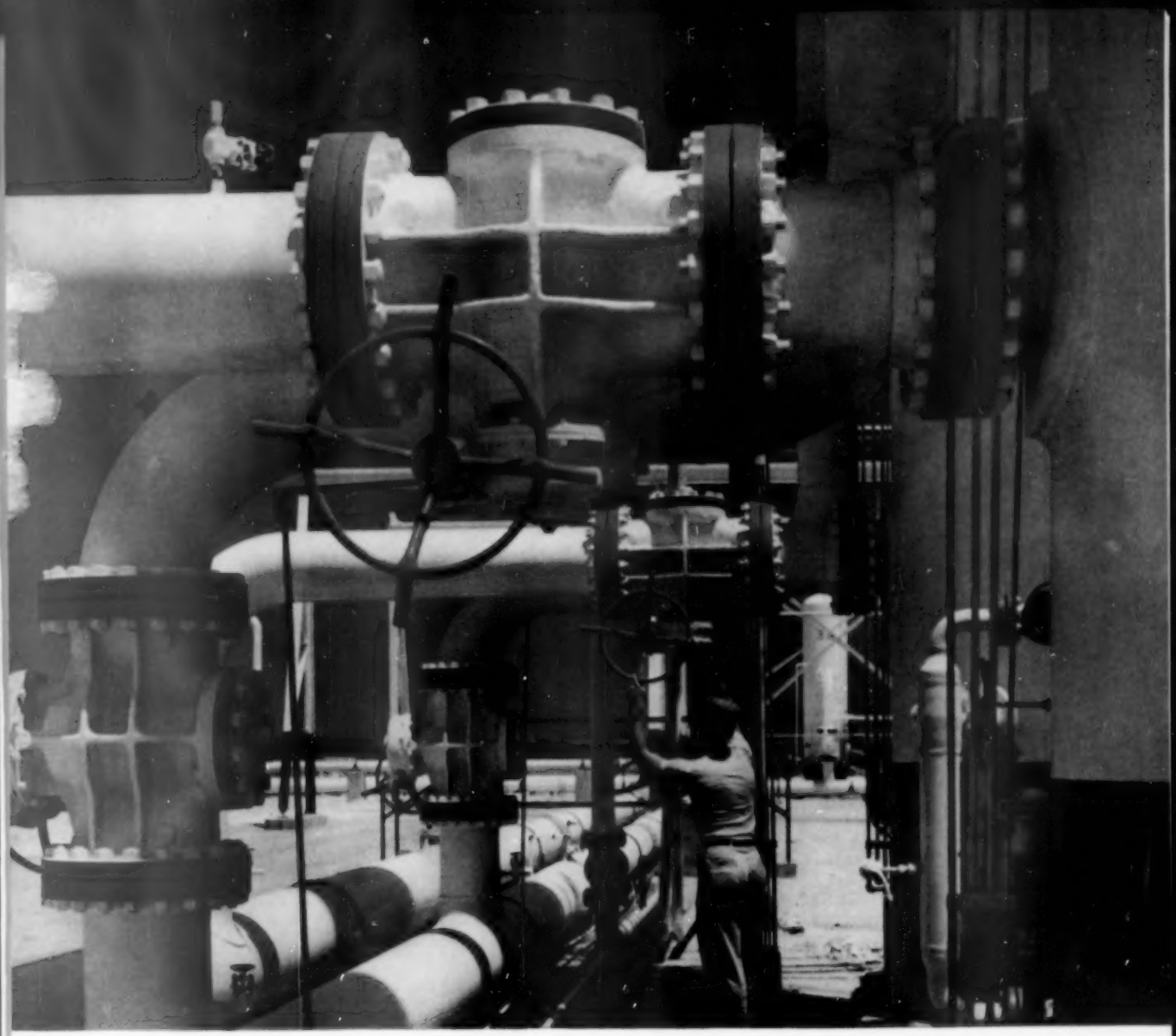
Eaton Axles in Trucks Today!
Ask your truck dealer
for complete information.

EATON

AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers



OPEN . . . CLOSE . . . EASY . . . QUICK . . . TIGHT

Certainly . . . no question the valve will operate when it's needed if it's a Rockwell-Nordstrom. It isn't necessary to experiment with valves—Rockwell has done the research for you. The originator of lubricant-sealed valves, with more valves in more different services than any manufacturer, Rockwell can fit the proper valves and lubricants to your application.

There is no substitute for Rockwell-Nordstrom experience—use it to save money on valves. *Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.*

THREE WAYS
THE NORDSTROM LUBRICANT WORKS

Lubricant surrounds each valve port with a vapor tight pressurized seal. **Nordstrom valves stay tight.**

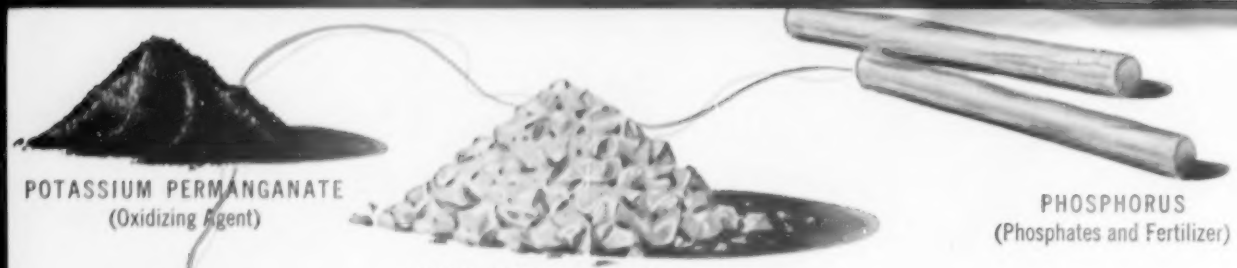
Lubricant acts as hydraulic jack—a fast quarter-turn to open or close. **Nordstrom valves operate quickly.**

Lubricant coats the plug for sliding action—no wear-producing wedging. **Nordstrom valves operate easily.**

Rockwell Built

NORDSTROM VALVES

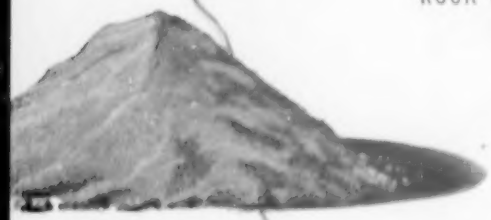
Lubricant Sealed for Positive Shut-Off



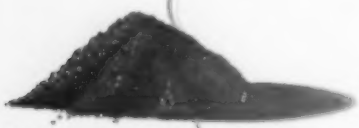
POTASSIUM PERMANGANATE
(Oxidizing Agent)

ROCK CRYSTAL SALT
(Brine)

PHOSPHORUS
(Phosphates and Fertilizer)

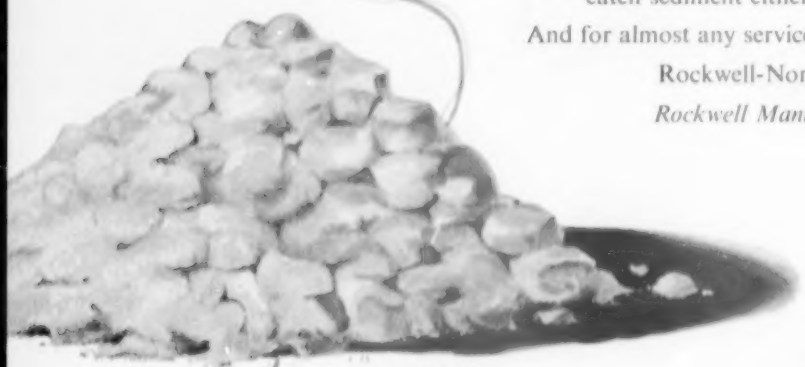


CLAY SLIP
(Ceramics)

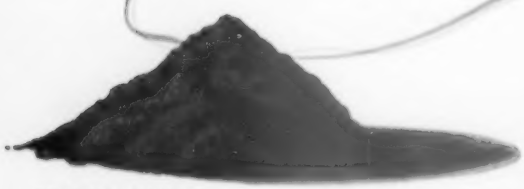


POTASSIUM DICHROMATE
(Oxidizing Agent)

BAUXITE
(Aluminum)



SULPHUR



FERRIC OXIDE
(Paints)

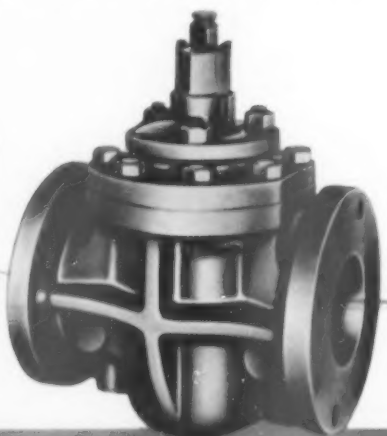
HOW TO END SLURRY WORRY

Slurries and entrained solids eat the heart right out of many types of valves—and incidentally eat up process industry profits at the same time.

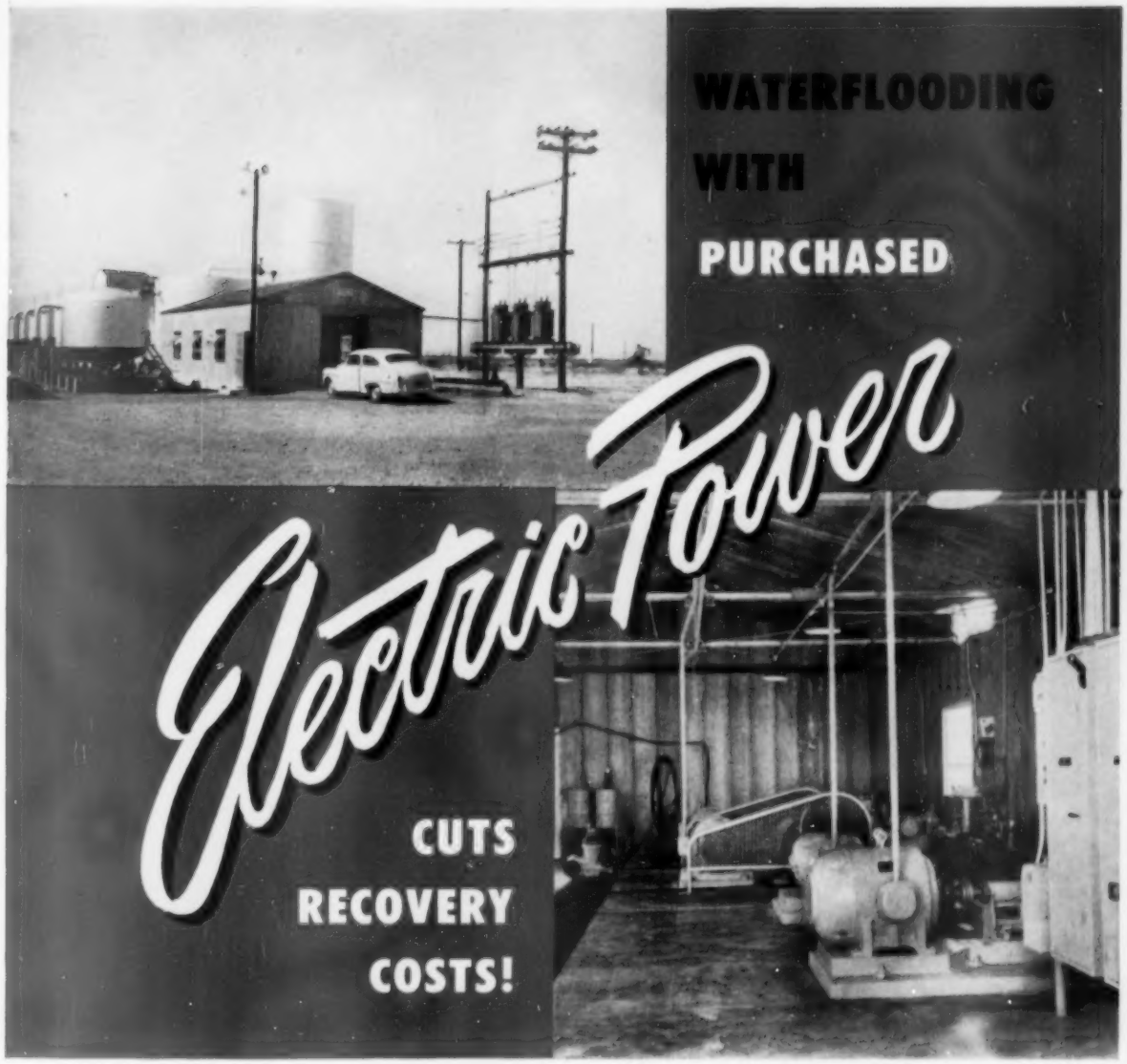
The point is that all solids are essentially abrasive, gritty, erosive. They tend to pit ordinary valve seats, or channel leakage paths, and replacement costs mount.

But not necessarily. Rockwell-Nordstrom valves have been proven to outlast other valves in many difficult services, like those shown here.

The reason is this: there's no exposed seat to wear away; instead there's a pressure seal of lubricant, and the essential points of closure are out of the path of flow. There are no valve body pockets to catch sediment either—just smooth, straight-through flow. And for almost any service, there's a correct and tested genuine Rockwell-Nordstrom lubricant. Get the facts from *Rockwell Manufacturing Company, Pittsburgh 8, Pa.*



Nordstrom Valves
Another Quality ROCKWELL Product



To secondary recovery operations, Purchased Electric Power brings dependable, 24-hour-a-day power at *lowest possible cost* . . . . just another instance which shows how PEP* is benefiting the Petroleum Industry.

Yes, PEP* works day and night — or operates on any fractional time schedule . . . . which means you pay only for power used. Upkeep and maintenance costs are lower, too . . . . which means that manpower and payroll costs are also cut to the bone.

Let Purchased Electric Power go to work for you! There's a Power Engineer at your nearest Electric Power Company who can give you the answers to all your power problems. Why not get in touch with him today?

CALL YOUR NEAREST ELECTRIC SERVICE COMPANY **for more facts, or address your request to P. O. Box 2771, Dallas, Texas**

Petroleum Electric Power association

ORGANIZED in the interest of greater service to the petroleum industry

* Purchased Electric Power

When you buy SPANG CW Steel Pipe for oil country air line service, you get a *top-quality* pipe that's been thoroughly tested and inspected before it is shipped to you.

TEST PRESSURES

Each length of SPANG CW Steel Pipe undergoes the rigid hydrostatic test at test pressures *well above* service requirements. This assures you of years and years of trouble-free use from your SPANG Pipe.

INSPECTION

You get further assurance of good pipe through SPANG's thorough inspection of each length. Threads and couplings are gauged and measured for length, pitch diameter, and quality. Each length is visually inspected inside and out to be positive you receive only *top-quality* SPANG CW Steel Pipe.

These and other quality-control factors go into making SPANG CW Steel Pipe tops for rugged oil country use . . . not only for air lines . . . but for water systems, oil gathering systems, gas lines, water flooding lines, and salt water disposal lines.

Get SPANG CW Steel Pipe for your next job. It's available in a full range of sizes at your nearby National Supply Store.

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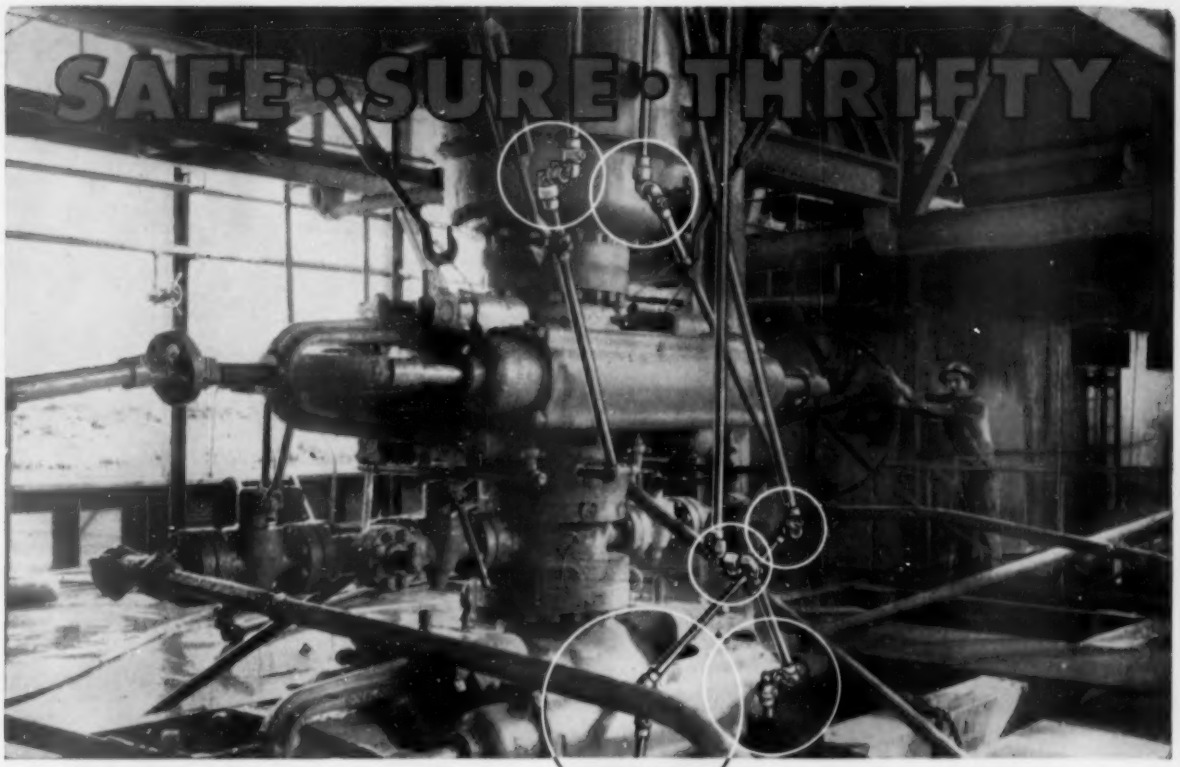
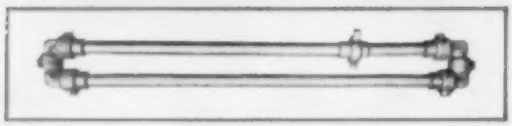
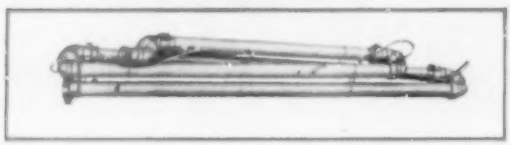
NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

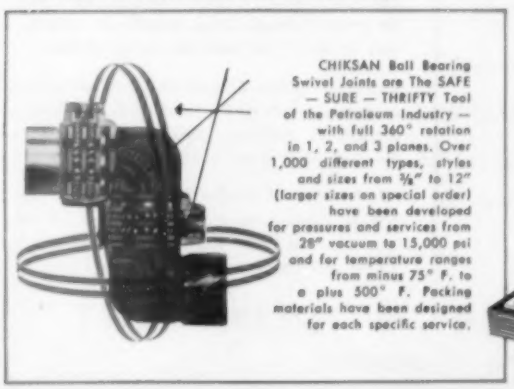




CHIKSAN High Pressure Cementing and Circulating Hose incorporates CHIKSAN forged steel swivel joints with flame-hardened ball races and high pressure type packing units. Maximum working pressure is 6,000 psi; for extra high pressure, CHIKSAN joints to 15,000 psi with maximum temperature 225° F.



CHIKSAN All-Steel Rotary Hose comes in two types — the Heavy Duty Rotary Hose for standard rigs and the All-Steel Rotary Hose for Portable Rigs. Both types of CHIKSAN Rotary Hose provide uniform strength and maximum safety.



CHIKSAN Ball Bearing Swivel Joints are The SAFE — SURE — THRIFTY Tool of the Petroleum Industry — with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles and sizes from ⅜" to 12" (larger sizes on special order) have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 75° F. to a plus 500° F. Packing materials have been designed for each specific service.

CHIKSAN JOINTS MEET ALL SAFETY CODE REQUIREMENTS

It's SAFE — SURE — THRIFTY to use CHIKSAN High Pressure Ball Bearing Swivel Joints and Chiksan All-Steel Hose on blow-out preventer control lines, cementing and circulating lines and rotary hose.

An investment in CHIKSAN Ball Bearing Swivel Joints will reduce the hazard of ruptured lines from fire damage and from high pressure, while providing complete flexibility, long life, and low maintenance, with considerable saving in "rigging-up" time.

For a quarter of a century CHIKSAN Swivel Joints and All-Steel Hose have met the rugged requirements of the petroleum industry. CHIKSAN products have been improved throughout the years to keep pace with the industry's increasingly exacting demands.

The Flow of Petroleum Relies on

CHIKSAN

Ball-Bearing Swivel Joints

Sold by Leading Supply Stores Everywhere

CHIKSAN TRADE MARK REG.

PESA

Write for Catalog 52-3-D, Dept. 10-OGJ

CHIKSAN COMPANY • SOSA, CALIFORNIA • Chicago 38, Illinois • Newark 2, New Jersey

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Export Company (Subsidiary), Sosa, California • Newark 2, N. J.

DE LAVAL CENTRIFUGAL COMPRESSORS

do a big job for gas pipelines

High pressure gas transmission on pipelines calls for equipment that's dependable as well as efficient. That's why De Laval centrifugal compressors have been chosen for these and many other booster stations.

De Laval centrifugal compressors offer important engineering features. ● Pressure contact shaft seal eliminates gas leakage. ● Construction is heavy and rigid throughout. ● Units have high load carrying capacity. ● They can be designed to handle an increased ultimate flow.

De Laval units, totaling 200,000 hp, are now in operation on major pipelines. De Laval engineers will be glad to give you the benefit of their wide experience in this field.

TRANSCO selected these three De Laval 5,000 hp steam turbine-driven centrifugal compressors for their Tylertown, Mississippi station.

EL PASO—These 30-inch De Laval centrifugal compressors are on the job at El Paso's Florida station. In addition, they have nine more De Laval units in use at other stations.

TEXAS EASTERN—The thirteen 2,500 hp centrifugal compressors on this company's 30-inch gas pipeline from Kosciusko, Mississippi, to Uniontown, Pennsylvania, are all De Laval.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

UNIFINING and CATALYTIC REFORMING

Now on stream at the Cut Bank, Montana, refinery of Union Oil Company of California are a Unifining Unit and a Catalytic Reforming Unit, both of which were engineered and constructed by Parsons.

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Now Cutler-Hammer offers an

IMPROVED OIL WELL PUMPING CONTROL

. . . that provides easy in-the-field modification of restarting characteristics

Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.

The NEW Cutler-Hammer Oil Well Pumping Control offers the same features which have made it the outstanding choice of oil field engineers; famous C-H dust-safe vertical contacts, finest program time-switch, *full* three-phase overload protection, incomparably cool C-H trouble-free operation. But another *exclusive* advantage has been added. This control may now be modified easily *while in use* to meet changes which occur in field operating conditions. The control panel now readily accepts either a C-H Low-Voltage Relay or a C-H Time-Delay Relay; panel space is provided and the panel is drilled. A diagram inside the cover shows all circuit arrangements with leads numbered to permit easy wiring changes.

Every oil field engineer will quickly grasp the significance of this improvement. With the basic Cutler-Hammer Oil Well Pumping Control, pumps resume operation as soon as power is restored after an interruption . . . as when lightning strikes the power lines. This is fine when there are only a few wells. But as a field grows, the combined load of many pumps restarting together is too heavy. Then either C-H Low-Voltage or Time-Delay Relays are added to the control. Low-voltage relays drop open on power interruptions and must be reset at each well. Pumps are thus restarted one at a time. Where automatic restarting is desired, the time-delay relays are used . . . set for different time intervals. When power is restored after an outage, one pump after another then restarts automatically . . . as determined by the different time-delay settings.

Ask to see this new control now. Or write for descriptive bulletin. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature available.

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MOTOR CONTROL
C-H

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ONE OF A SERIES

You Get Many Benefits
by Specifying VICKERS® Hydraulics

Hydraulics School

for Customers' Own Service and Maintenance Men

Manufacturers who have Vickers Hydraulic Equipment on their machines can have their own service men trained in the Vickers Hydraulics School. Since its beginning in 1945, this school has trained more than 800 men from approximately 400 companies. There is no tuition charge for this training course.

These men are given a thorough schooling in hydraulic theory and practice . . . and in the operation and maintenance of Vickers Hydraulic Equipment. The benefits to manufacturers of Vickers-equipped machines are obvious. Of equal importance are the benefits to users of such machines who are thus assured of better maintenance.

Again, this is only one of many reasons why it pays to specify Vickers Hydraulics.

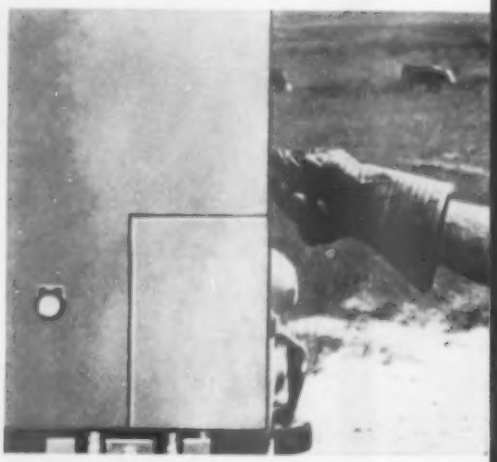
VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1448 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND DETROIT • HOUSTON • LOS ANGELES (Metropolitan) NEW YORK (Metropolitan) • ODESSA • PHILADELPHIA (Metropolitan) • PITTSBURGH • ROCHESTER • ROCKFORD SEATTLE • TULSA • WASHINGTON • WORCESTER

6393

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

PROGRAM TIMER DOOR permits quick and easy access for adjusting timer. Padlocking of timer door will lock complete starter.



ALL FREQUENT OPERATING FUNCTIONS, including resetting of relays, can be performed without entering starter part of enclosure.

NEW G-E OIL-WELL PUMPING STARTER

Features exclusive gasketed enclosure and ventilated overload relay compartment

The all new G-E oil-well pumping starter includes those features you, in the oil industry, asked for. Specifications for this new starter were written by oil field personnel and a sample starter was taken to oil industry engineers for checking.

EXCLUSIVE IN THE G-E OIL-WELL PUMPING STARTER is the gasketed enclosure and ventilated overload relay compartment. This separate compartment helps prevent bi-metallic overload relays from tripping prematurely due to heat from the sun. Compartment space is adequate for installing a third relay in the field if required.

BUILT FOR ALL WEATHER CONDITIONS, the new G-E oil-well pumping starter has a baked-on enamel finish over a phosphate-treated base. The enclosure of the new, lighter, more streamlined starter is gasketed with heat-resistant neoprene to prevent the entrance of dust and moisture.

OTHER OUTSTANDING FEATURES include Flamenol* wire insulation which resists flowing and insulation breakdown from heat; a new undervoltage relay for more positive action, a sequence restarting timer for staggering return of wells to service after power outage, and a snap-action HCI disconnect switch.

FOR MORE INFORMATION contact your nearest G-E Apparatus Sales Office, Agent or Distributor, or write to Section 730-56, General Electric, Schenectady, N. Y. Ask for bulletin GEA-6153.

*Reg. trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

which impulse for you?

STANDARD

The standard YARWAY Impulse Steam Trap serves all normal trapping requirements. Factory set to operate without adjustment at all pressures from 20 psi to 400 psi (Series 60) and 600 psi (Series 120). For pressures below 20 psi, merely remove split washer.

Numerous advantages like:

small size
quick heating
steady temperatures
stainless steel construction
one moving part
non-freezing
low cost

More than 900,000 used throughout industry.

Write for YARWAY Bulletin T-1740.

HIGH PRESSURE, INTEGRAL STRAINER

YARWAY Integral Strainer High Pressure Impulse Steam Traps operate on some of the highest pressure steam lines in the country. Same operating principle as the standard YARWAY Impulse Trap. Strainer built into trap.

Ample capacity when system is being "warmed up"—yet will handle relatively small amounts of high temperature condensate without losing prime. Six sizes—½" to 2". Pressures to 1500 psi (flanged ends) or 2500 psi (welding ends).

Write for YARWAY Bulletin T-1740.

YARNALL-WARING COMPANY
136 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY

impulse steam traps

YARWAY Impulse Steam Traps and Fine Screen Strainers are stocked and sold by more than 250 convenient local distributors. Write for name of one nearest you.

Built for SEVERE DUTY

frequent starting • inching • reversing • dynamic braking

ALLIS-CHALMERS

Type 256

AIR CONTACTOR

FOR 2300 TO 5000-VOLT MOTOR CONTROL

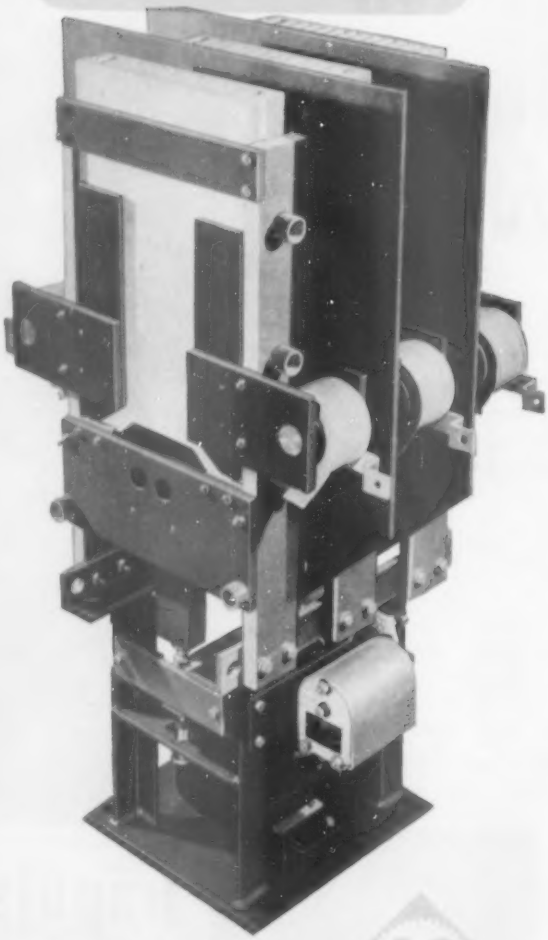
Durability and long-term dependability were given prime consideration in the design of the Allis-Chalmers Type 256 air-break contactor. As a result, the roughest repetitive duty becomes routine — contact operations are actually numbered in the millions with a minimum of servicing.

DESIGN FEATURES

By utilizing a simple vertical motion and double break contacts, troublesome maintenance factors, such as mechanical linkages, turning shafts, shaft bearings and flexible leads, have been eliminated. From the operation standpoint, two gaps in series cut arc voltage in half. Rapid arc extinction is further facilitated by magnetic blowouts at each gap, operating with arc chutes designed to take full advantage of dual blowouts.

In Allis-Chalmers Type H high voltage starters, Type 256 air-break contactors — along with meters, overload relays, current limiting fuses, auxiliary switches — are coordinated to meet heavy duty demands — to provide high capacity interruption and complete protection for man, motor and machine. For complete information see your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletins 14B6410B and 14B7303.

A-4325



ALLIS-CHALMERS

JOHNSTON SELECTIVE ZONE TESTER

gives you all four with only one trip in the hole

TESTS MORE THAN ONE ZONE in a single trip . . . and the Selective Zone Tester has been field proven in actual service in many areas.

• **ELIMINATES CEMENT PLUG!** Packers above and below the testing zone seal it off, special control assures accurate results!

TESTS ZONES YOU PASS UP to allow running a DST on other possibly productive levels. Even pinpoints gas/oil and water/oil contacts in just one trip!

TESTS WITHOUT TAIL PIPE, and at any level! You save rig time, save money, get a more accurate test than ever before.

JOHNSTON TESTERS, INC.
HOUSTON, TEXAS

Gentlemen:
At no obligation, please rush complete information on the Johnston Selective Zone Tester.

Name _____
Firm _____
Address _____
City _____ Zone ____ State ____

AVAILABLE everywhere
ACCURATE every time

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

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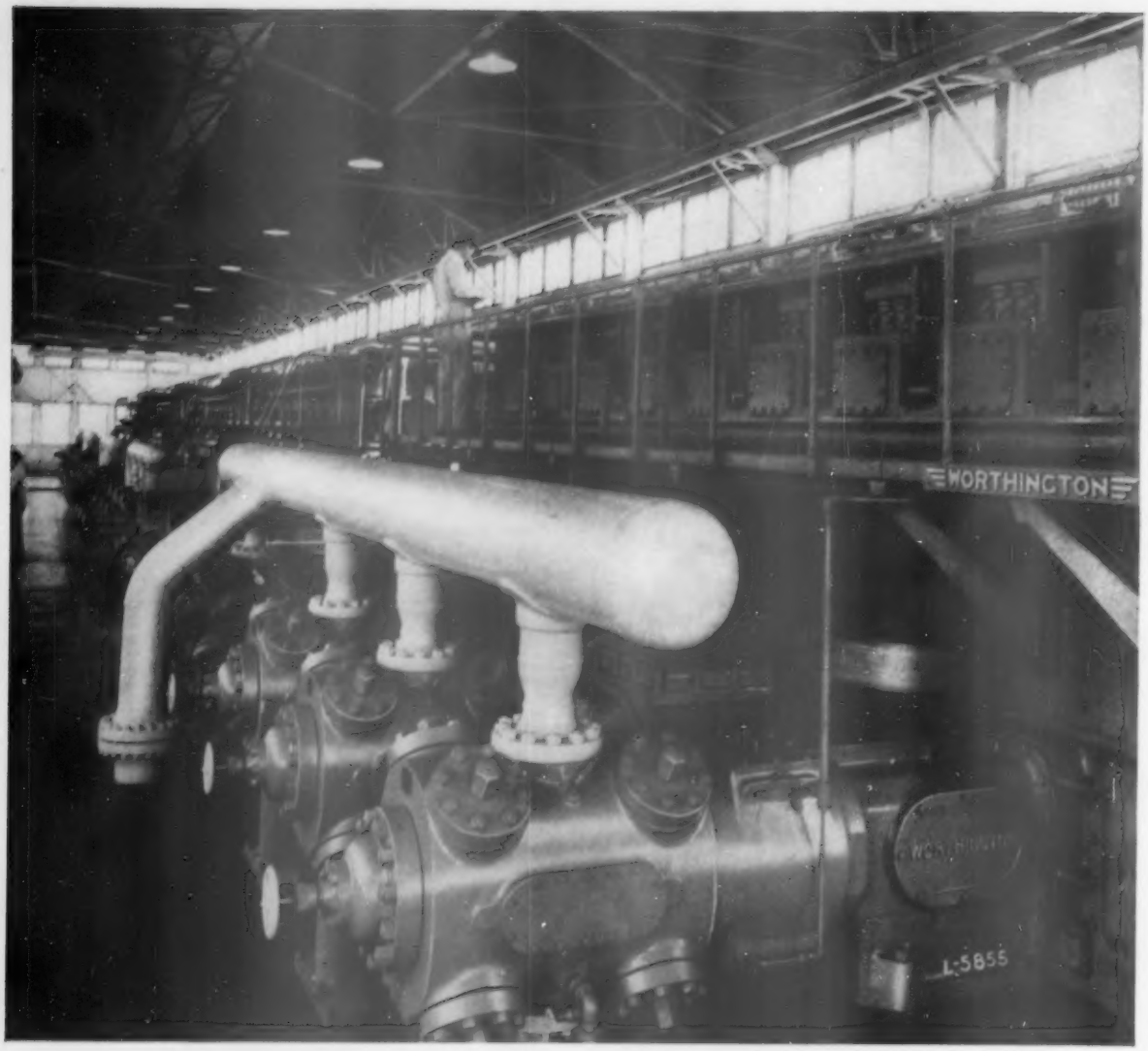
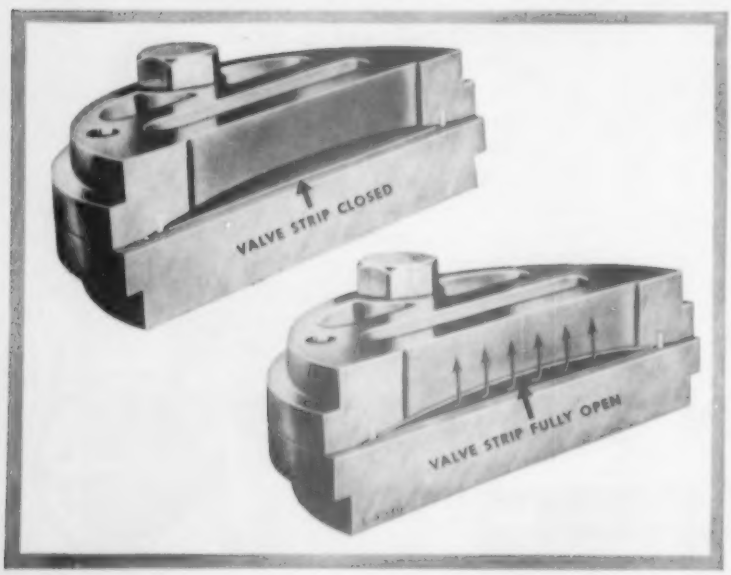
FORMATION AND CASING TESTING — JOHNSTON



MODERN, WORTHINGTON-EQUIPPED Palco, Kansas, compressor station of the Kansas-Nebraska Natural Gas Company. Latest unit to be installed at Palco is the 2000-hp Worthington UTC shown in the foreground.



FEATHER* VALVE USED EXCLUSIVELY in Worthington compressors seats by contact, not by impact; ends remain in contact with the seat at all times. It operates quietly, efficiently, and with minimum maintenance.
**Reg. U.S. Pat. Off.*

Kansas-Nebraska Natural Gas adds three more Worthington Engine-Compressors

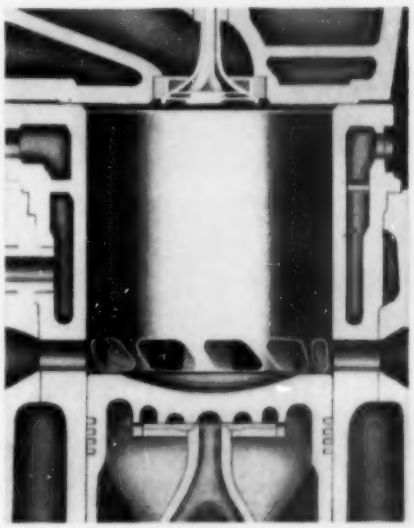
Three new UTC's bring Worthington total at K-N to 35 engine-compressors

When the Kansas-Nebraska Natural Gas Company started operations in 1936, their peak through-put that year was about three million cubic feet of gas per day. At that time, they were equipped with 6 Worthington engine-compressors, installed at Stockton, Kansas, and Elm Creek, Nebraska.

Since then, Kansas-Nebraska has added 29 more Worthington engine-compressors — and increased their through-put to over 181 million cubic feet per day.

The latest additions to this fast-growing line were three Worthington UTC Uniflo engine-compressors installed in 1951 and 1952. All these UTC units use Worthington's Uniflo timed-scavenging method — one big reason for the smooth performance they give. Uniflo scavenging assures a "clean sweep" of burned gases. And, of course, every Worthington compressor is equipped with the exclusive Feather Valves — the lightest, tightest, most efficient valves made.

Find out for yourself how Worthington UTC's can pay off in your gas compression. Built in sizes of 1000 to 2000 hp, the UTC's have an extremely wide range of applications. Get in touch with your nearest Worthington district office or write for Bulletin S500-B23B to Worthington Corporation, Engine Division, Buffalo, N.Y.



WORTHINGTON'S TIMED-SCAVENGING SYSTEM, in the "vital power center" shown here, assures Kansas-Nebraska of high efficiency operation and minimum maintenance from their Worthington engines. Features: complete removal of exhaust gas, more thorough charging with gas and air, positive timing for optimum combustion and effective super-charging.

EK.3.1

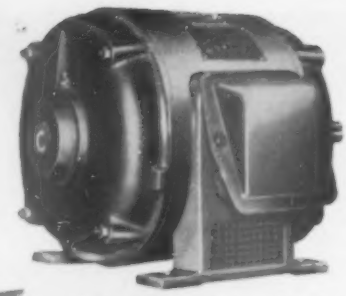
WORTHINGTON

Only Worthington Compressors Give You Feather Valve Performance

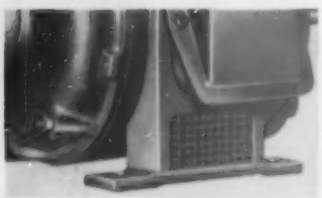
Y-Types • Engine Starting • Horizontal • Portable • Radial • Gas Engine

NEW Century WeatherGARD®

OIL FIELD MOTORS



These are the new re-rated motors — now available in some ratings.



Improved to Provide Top Performance ...Long Life

SMALLER — LIGHTER

More uniform silicon-laminated steel; thinner, tougher "Mylar" slot insulation—just two of the many technical developments that help make these new Century Performance Rated Motors so much smaller and lighter.

NEW WEATHER-GARD CONSTRUCTION

New internal motor ventilating methods permit end bracket and frame design that gives far better protection from rain, snow and sleet . . . still maintain 40°C. temperature rise.

SCREENED OPENINGS

Screens in openings protect against birds, small rodents or animals, leaves or twigs from entering the motor.

EVEN MORE DEPENDABILITY

Improved plastic impregnating varnish and plastic insulated magnet wire provide unusual resistance to abrasion, moisture and heat. These new materials possess far better dielectric qualities. Die cast aluminum rotors are individually, dynamically balanced to assure freedom from vibration.

For more information *on these and other Century motors for the petroleum industry, see your supply store, or write Century for Oil Industry Bulletin 14-141-P1.*

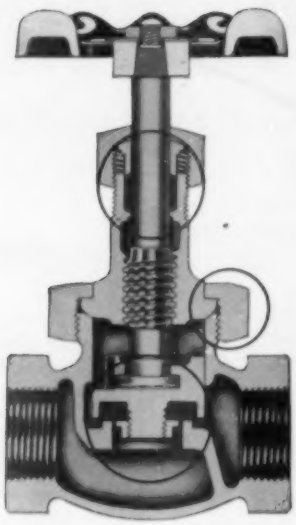
Performance Rated® Century C MOTORS

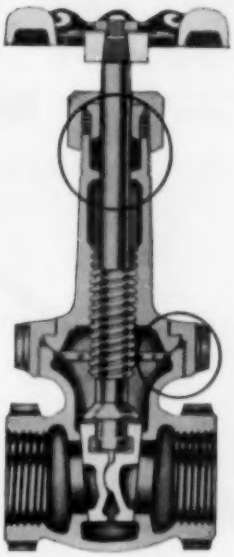
1/3 to 400 H.P.

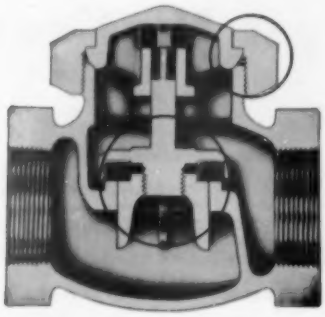
CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points In Principal Cities







GATES - GLOBES - ANGLES - CHECKS

Special synthetic packing in the amply proportioned stuffing box provides an absolute seal and reduces stem friction. Best packing there is for volatile fluids!

Line-contact, body-bonnet joint is designed for a leakproof seal by mating the spherical seat on the bonnet with an angular seat on the valve body.

Renewable synthetic discs on globe and angle valves are long wearing . . . and resilient for positive closure. Slip-on-type disc holders have adequate guiding to assure accurate seating.

. . . valves for positive control of L-P Gas!

All OIC Valves for L-P Gas service are Underwriter approved. They are recommended for volatile fluids, light oils, hot or cold water and air.

Valve bodies are sound, cast of A. S. T. M.—B61, steam bronze and fitted with heavy, union-type, body-bonnet connections for long leakproof service.

Stems are accurately machined of OIC 40 Alloy (an aluminum-silicon-bronze which won't gall or seize).

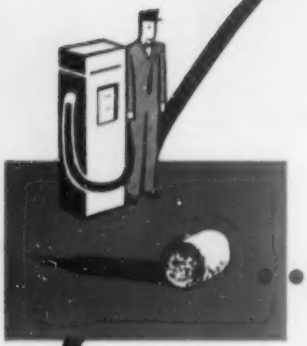
For complete information on sizes(¼″ to 3″), pressures (400 lbs. WOG, non-shock) and prices, write for the OIC L-P Gas Folder, Form 802 or contact your local OIC Distributor.

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES | **BRONZE & IRON, FORGED & CAST STEEL, LUBRICATED PLUG VALVES**

with ATLANTIC



..it's the catalyst that counts!

The Davison Chemical Corporation has teamed with The Atlantic Refining Company in the development of a catalyst for reforming straight run and cracked gasolines to a product of higher octane level. Among the important tasks delegated to Davison was the translation of this catalyst from laboratory to commercial production and at the same time impart optimum selectivity, stability, ruggedness and regenerability.

Today, Davison is producing Atlantic Platinum Reforming Catalyst on a commercial scale and shipments are being made at an increasing rate to licensees of the Atlantic Catforming Process. Davison has an outstanding record of this type of development in many fields of commercial catalyst production. If you have a catalyst problem, see your Davison Field Service Engineer or write.

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

BALTIMORE 3, MARYLAND

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, TRIPLE SUPERPHOSPHATE, PHOSPHATE ROCK, SILICA GELS AND SILICOFLUORIDES. SOLE PRODUCERS OF DAVCO® GRANULATED FERTILIZERS

CHEMICAL PROCESS NEWS

PUBLISHED BY CHEMICAL PROCESS DIVISION, THE M. W. KELLOGG COMPANY — OCTOBER 1954

NOTES ON PHENOL-FROM-CUMENE

Cumene, a war-time antiknock component for aviation gasoline for which Kellogg originated a manufacturing process and built a number of plants, is again in the news. Currently the company is building a plant, after having developed the mechanical design in which cumene will be produced and then used as an intermediate for manufacturing phenol in the Hercules-Distillers phenol-from-cumene process.

* * *

In this process, cumene is first oxidized to form cumene hydroperoxide. The latter is then split in a cleavage reaction into phenol and acetone, the two major products. The reaction also produces a small amount of methyl styrene.

* * *

The over-all process is an excellent example of how certain refinery products can be upgraded to industrial chemicals with a concomitant radical increase in value.

* * *

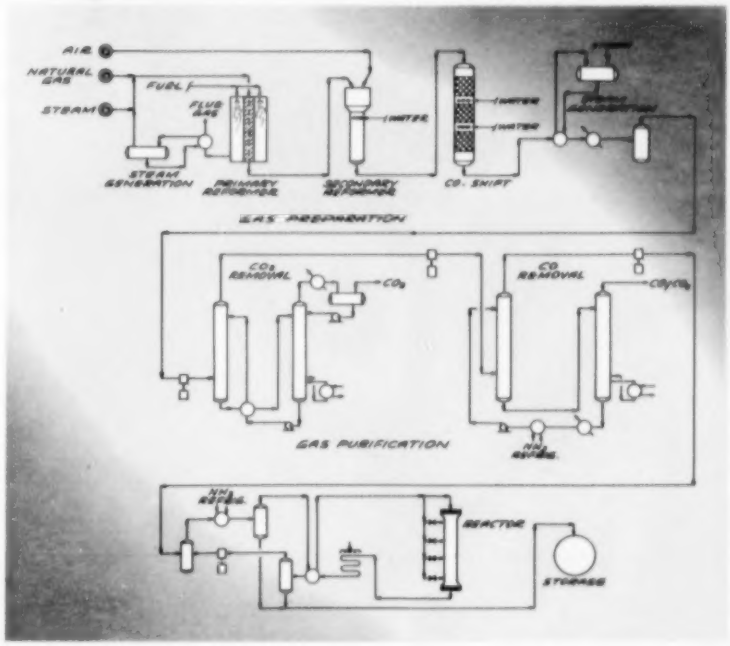
For example, propylene—a refinery by-product available at relatively low cost—makes up a third of the original feedstock volume when it is combined with benzene by alkylation to form cumene. After oxidation and cleavage, phenol is obtained from the benzene part of the initial input, and the low-cost propylene third of the input yields a substantial amount of acetone.

* * *

Thus, at present prices, acetone can be regarded as an attractive bonus for the producer—over and above the phenol produced as the major product. Moreover, the small quantity of methyl styrene made in the process can either be reconverted to cumene and used again or it can be sold to consumers in the plastics industry.

* * *

In addition to these favorable economic aspects, the process features low initial investment and operating expense. High pressures and temperatures are not used, and the consumption of chemicals such as alkalis and acids is comparatively low.



Unusually Low Investment Cost for Large, New Plant to Produce Ammonia

Kellogg has just been awarded the contract for a large ammonia plant which will make this basic fertilizer ingredient at the unusually low investment cost of approximately $50 per ton of annual capacity.

The plant, scheduled for completion in mid-1955, will be erected near Lima, Ohio, for The Standard Oil Company (Ohio). It will produce 300 tons of ammonia daily.

The major reason for the reduction in investment lies in the fact that the process employs only one ammonia synthesis section. Furthermore, operating experience with Kellogg ammonia converters has shown that they can be substantially reduced in size as can the heat exchangers without lowering capacity.

From the standpoint of operating costs, the new plant will have electrically-driven centrifugal compressors with concomitant savings in cooling water per-ton-of-ammonia produced.

As may be seen from the flow sheet, the plant will charge natural gas to a reformer where about 70% of the feed is converted into raw synthesis gas. This mixture is then fed to a secondary reformer where nitrogen in the form of air is introduced into the stream. Heat of combustion supplies the energy necessary to reform the remainder of the natural gas and to elevate the temperature to 1700°F.

As the mixture leaves this reformer, it immediately enters a quench vessel where its temperature is lowered by direct water quench. This not only brings the temperature down to the required shift reactor temperature but also provides the steam for the shift reaction.

From this point the mixture is fed to a gas purification section, the first step in which is a shift reaction. This converts the CO in the stream to CO_2, simultaneously producing H_2 as a result of the reaction with water in the form of steam.

Carbon dioxide removal, employing a regenerative MEA system, follows this step. This method of removing CO_2 has five advantages: no oxygen contamination, negligible synthesis gas loss, essentially complete removal of CO_2, the production of CO_2 in a pure usable form, and compactness of equipment.

Following this purification operation, traces of carbon monoxide left in the stream are removed. The synthesis gas is then passed through exchange and charged to the catalytic converters. The product gases from the converters are cooled in water coolers and then by exchange with

(continued on the following page)

(continued from previous page)

converter feed gas in the recycle gas exchangers. Anhydrous liquid ammonia is separated out in the primary separator and, after further cooling to 25°F in a refrigeration system, goes to an anhydrous ammonia product flash drum.

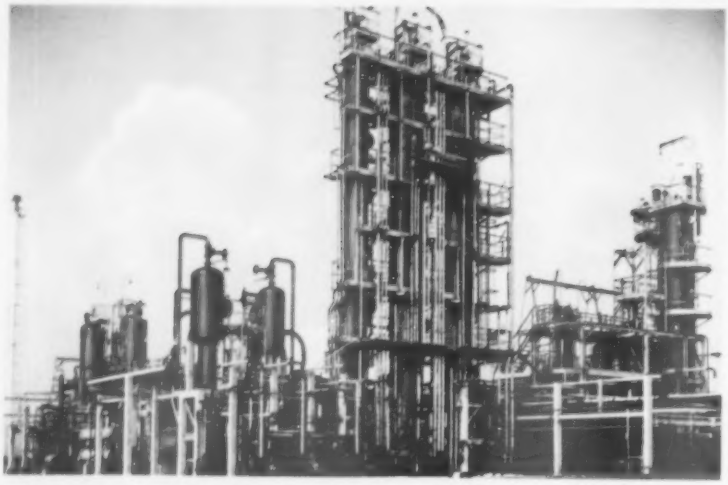
Six Solexol Plants in Six Years

In the six years since the process was first perfected in its laboratories, Kellogg has designed and built a total of six Solexol refining plants. The most recent one, a strategically important plant located in Norway, will among other things enable that country to double its production of glycerine.

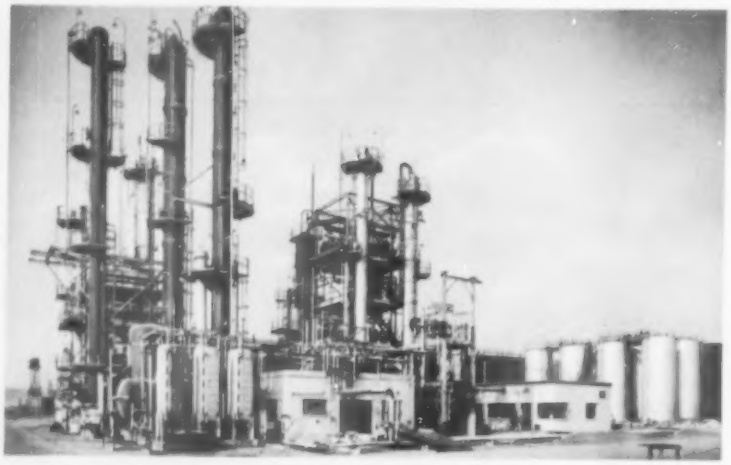
Solexol refining is a liquid-liquid extraction process—utilizing propane as the solvent—which has been applied primarily to extraction of vegetable and fish oils. The extraction is carried out at specified conditions of temperature, pressure and propane ratio in a continuous operation by counter-current contact of the oil and liquid propane in the fractionating towers.

At relatively low temperatures, liquid propane is miscible in essentially all proportions with glyceride oils. As the temperature is increased, progressively increasing amounts of an oil phase are precipitated, with different constituents of the various oils coming out of solution at different temperatures.

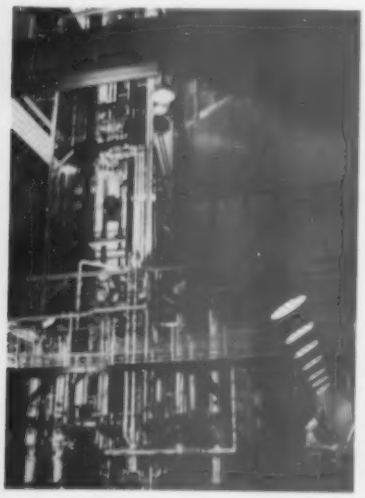
In the Solexol process, this property of propane forms the basis for the commercial separation of oils into their component parts. Separation is accomplished in the fractionating towers, while the remainder of the plant serves primarily to recover the propane from the oil fractions. Only small quantities of propane are required for make-up to maintain a constant inventory in the system.



Shown above is a typical Solexol plant. This one, located on the U. S. East Coast, is used for processing menhaden oil. The plant includes a propane destearinization unit for producing winterized oils.



The first phenol-from-cumene plant to employ the Hercules-Distillers process was this one located in Canada. (Details about the process may be found on the preceding page.)



Solexol pilot plant in Kellogg Petroleum and Chemical Research Laboratories.

For further information, technical data, etc., relating to chemical or petrochemical processing, write

CHEMICAL PROCESS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

In Canada
The Canadian Kellogg Company, Limited

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KELLOGG PULLMAN

Typical Current Kellogg Chemical Plant Contracts in the fields of—

- ★ Ethylene
- ★ Polyethylene
- ★ Phenol-from-Cumene
- ★ Anhydrous Ammonia
- ★ Methanol
- ★ Phthalic Anhydride
- ★ Liquid Fuel and Chemicals Synthesis from Coal
- ★ Glyceride Purification
- ★ Nitric Acid
- ★ Ammonium Nitrate
- ★ Ammonium Sulfate

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BENZENE XYLENE TOLUENE
KELLOGG
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"I can't afford to use second-rate hose. Mine has to be tops. That's why I use U.S. Royal 4 Rotary Hose"

says "Red" Royal

With costs the way they are today, "Red" Royal has to drill the *same* footage in *fewer* days than before—if his boss wants to stay in business. So when it comes to rotary hose, for example, he picks U.S. Royal 4 Rotary Hose—he's taking no chances on downtime with second-rate hose. U.S. Royal 4 can handle the heaviest pressures of today's pumps. No need to stop work while you hitch up a standby. You save both time PLUS money that used to be tied up in standby hose.

U.S. Royal saves in other ways...no downtime for lubrication. It has complete flexibility from nipple to nipple. You can use it all the way from spud to pay.

For mud pump suction hose, "Red" Royal sticks to non-collapsible U.S. Giant.® This hose is so flexible that it permits quick adjustment of the intake of the line to the right position in the slush pit *without* changing connections.

Developed by Science—
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Available in all FIELDS at SUPPLY STORES

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so we'll make this quick.
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can save an average size refinery
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ALUMINUM COMPANY OF AMERICA
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ANOTHER WAY YOU SAVE WITH FORD *TRIPLE* ECONOMY

New Ford Tandem Axle T-800 is rated for 40,000 lbs. GVW, 60,000 lbs. GCW. New Low-Friction, 170-h.p. *Cargo King* V-8 gives outstanding performance with gas-saving economy.

New driver comfort cuts trucking costs!

Deluxe Cab shown, extra cost.

New Driverized Cabs cut fatigue! Big, curved, one-piece windshield for better visibility. Exclusive Ford *seat shock snubbers* to level the ride. New non-sag springs. New free-breathing *woven* plastic upholstery that lasts longer, gives year-around comfort.

"Cut Your Speed After Dark."

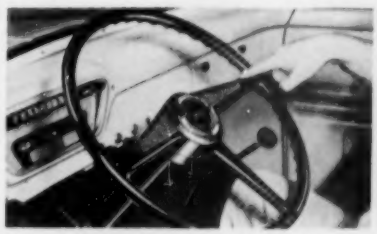
Helping the driver do a better job saves money by saving valuable truck *time*. What's more, driver comfort is an incentive for safety and for better vehicle care that prolongs truck life, cuts maintenance costs.

Only a Ford Truck gives you full benefit of these savings. For only Ford has the *Driverized* Cab, most comfortable of truck cabs, and such time-saving controls. For complete information, see your Ford Dealer, or write to Ford Division, Ford Motor Company, Dept. T-20, Box 658, Dearborn, Michigan.

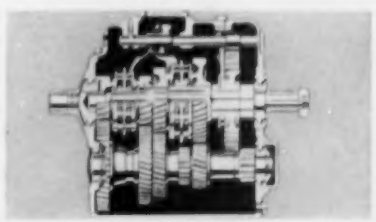
SAVE WITH ALL THREE!

1. Gas-Saving Power!
2. Driver-Saving Ease!
3. Money-Saving Capacities!

And . . .
Ford Trucks last longer, too!

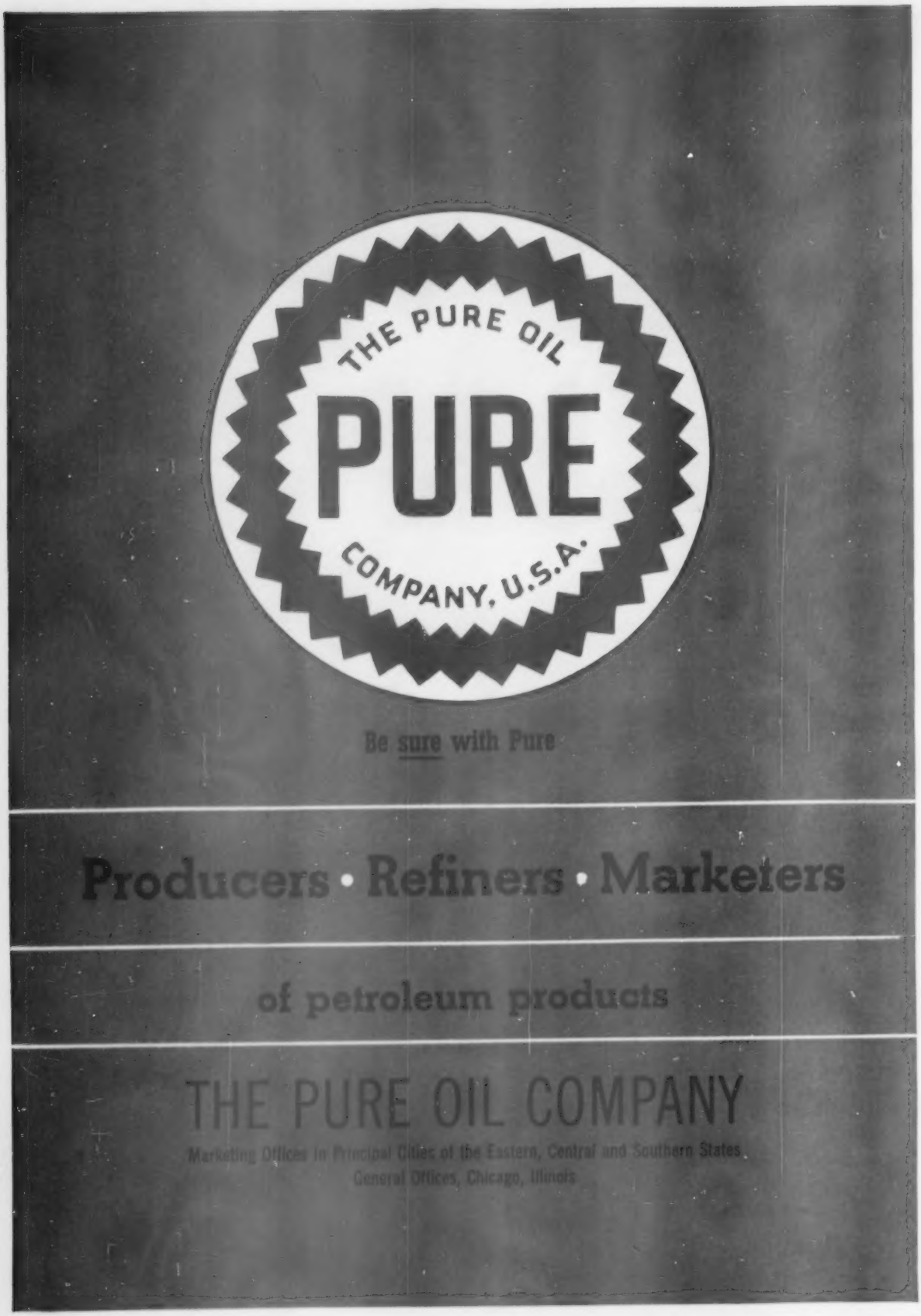


Power Steering! Cuts steering effort up to 75%! Standard on T-800 tandems, optional at low extra cost on most other Big Jobs!



Synchro-Silent! For faster, easier shifting, Synchro-Silent type transmissions are standard on all Ford Trucks at no extra cost!

FORD *TRIPLE ECONOMY* TRUCKS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PURE
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Be sure with Pure
Producers • Refiners • Marketers
of petroleum products
THE PURE OIL COMPANY
Marketing Offices in Principal Cities of the Eastern, Central and Southern States
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It takes Six Bolts –

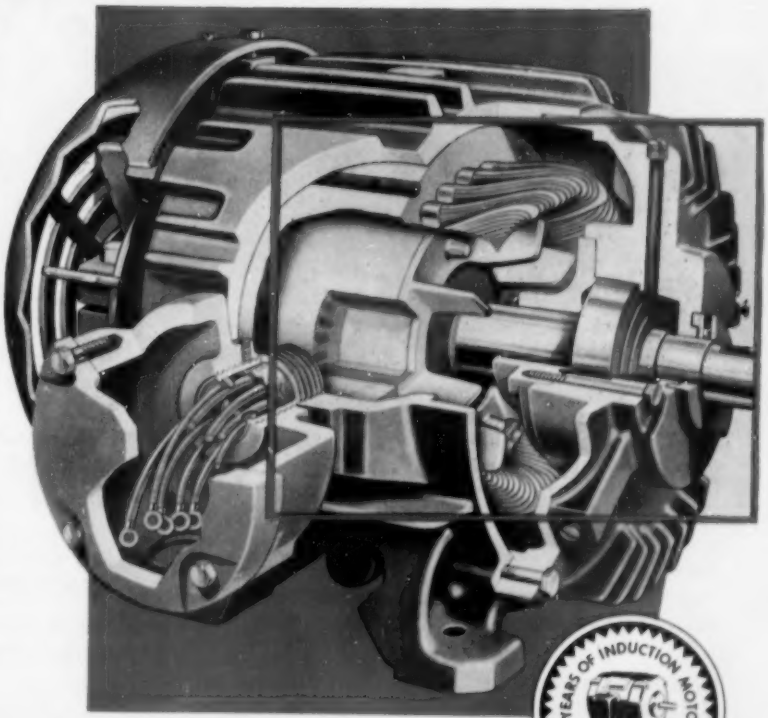
not just four

to give full bearing protection for greater motor performance

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.



50 YEARS OF INDUCTION MOTORS
ALLIS-CHALMERS-NORWOOD WKS.

Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4445

In Every Major Oil Field

THERE'S A BUCYRUS-ERIE SPUDDER DISTRIBUTOR AT YOUR CALL

FIRST WITH THE FINEST IN SPUDDERS!

THIRTY-FOUR distributor outlets for Bucyrus-Erie spudders, located in all principal oil fields of America, are at your service whenever, wherever you need them. Check the list below for the location of the distributor nearest you. They're in business to help you make money. See them often. They'll analyze your drilling problems, recommend ways to solve them with Bucyrus-Eries.

BEACON SUPPLY CO. . . . . Pampa and Borger, Tex.
BECKWITH MACHINERY CO. . Pittsburgh (East Liberty), Bradford and Clearfield, Pa.
BRADFORD SUPPLY CO. . . . . Princeton, Ind.
BUCKEYE SUPPLY CO. . . . . Zanesville and Wooster, Ohio; Chase, Great Bend and El Dorado, Kan.
DRILLERS SUPPLY CO. . . . . Joplin, Mo.
DRILLING AND MINING EQUIPMENT CO. . . . . Los Angeles, Calif.
GREAT NORTHERN TOOL & SUPPLY CO. . . . . Billings, Cut Bank, and Kevin, Mont.; Casper, Wyo.
IVERSON SUPPLY CO . . . . . Tulsa, Oklahoma City and Okmulgee, Okla.; Ft. Worth, Midland, Odessa and Snyder, Tex.; Artesia and Farmington, N.M.
McJUNKIN CORPORATION . . . . . Charleston, W. Va.; Allen, Ky.
OLYMPIC SUPPLY CO. . . . . Seattle, Wash.
THE STRAKER SUPPLY . . . . . Mount Pleasant, Mich.

CANADA

LUCEY CANADIAN SUPPLY CO. . . . Calgary and Edmonton, Alta.
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TILLSONBURG PIPE & SUPPLY CO. . Tillsonburg, Ont.

4554

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

*DISTRICT SALES OFFICES
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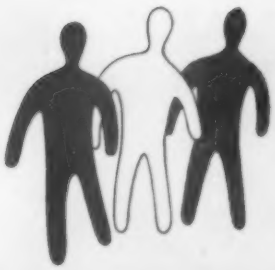
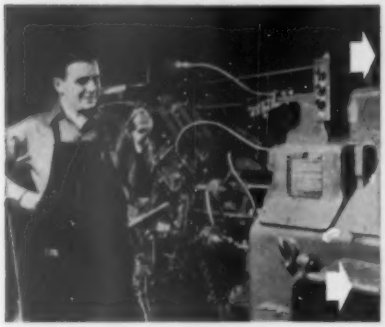


HERE'S WHAT HAPPENS WHEN REPUBLIC'S 3-D METALLURGICAL SERVICE GOES INTO ACTION



The field metallurgist comes right into your plant. He checks furnace temperatures and heating cycles, machines, set-ups, feeds, speeds, everything which affects your production.

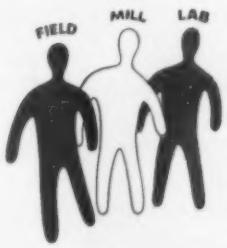
He talks to your plant and engineering people, asks questions, finds out what you want your alloy steels to do. He takes this data with him.

The Republic Field Metallurgist talks over his report with Republic's Mill Metallurgist. Experienced in producing alloy steels, he adds his knowledge, checks it against your problem. And since Republic controls its alloy steels from ore to finished product, he can trace heats of steel.

The field metallurgist next talks things over with the Republic Laboratory Metallurgist. His data on tests of alloy steels is added to the material of the field and mill metallurgist.

Then, all three men put their heads together and come up with a recommendation that is the result of pooling their findings and their experience with alloy steels. And since Republic pioneered the manufacture of alloy steels, this recommendation is based on solid data.

The Republic Field Metallurgist passes this recommendation on to your engineers and plant personnel. He works with them to see that your problem is solved satisfactorily, right in your plant. It's his job to see that you get all the advantages out of the alloy steels you use.



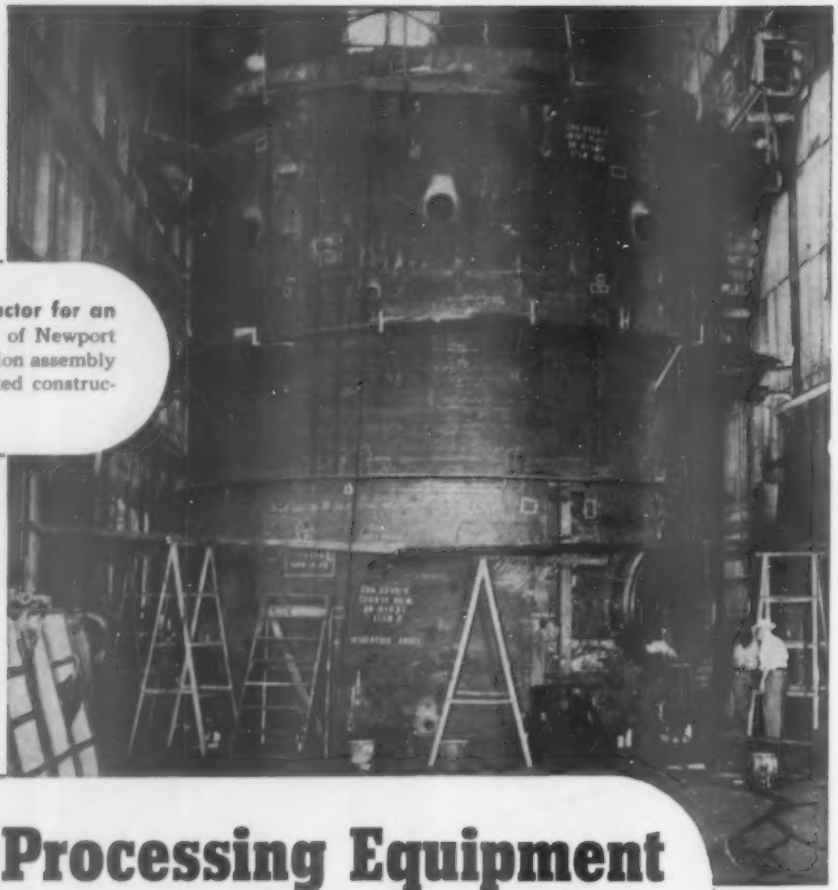
The results often include lower production costs, better quality, or even changes in design. You can have this free service by calling your local Republic Steel sales office.

Republic ALLOY STEELS

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N.Y.

Other Republic Products Include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing.



Course number four of a reactor for an overseas oil refinery. Typical of Newport News plant methods, the precision assembly of this unit in the shop expedited construction of the reactor in the field.

Petroleum Processing Equipment

...Built by Specialists in Metal Fabrication

Careful attention to detail characterizes the work of Newport News craftsmen...

They've fabricated millions of tons of steel including corrosion-resistant alloy, clad and other special steels for many diverse industries.

Newport News handles the job exactly as you want it done, for maximum results per dollar invested.

Specialized production techniques, advanced plant methods and a complete range of facilities along with many special purpose machines contribute to the excellence of Newport News fabrication.

Let us bid on equipment for your present or future projects. Learn how Newport News can help you...send for our booklet entitled "Facilities and Products." It's yours for the asking.

Newport News Shipbuilding and Dry Dock Company

Newport News, Virginia

PROCESS EQUIPMENT NEWS

PUBLISHED BY FABRICATED PRODUCTS DIVISION, THE M. W. KELLOGG COMPANY OCTOBER-NOVEMBER 1954

Interchangeable Bundles for Three Condenser Units

Three condensers recently completed in the Kellogg shops for a major refiner represent an optimum interchangeability of bundles—a feature every refiner wants but one that is often difficult to achieve in a unit without over-engineering it.

The three condenser units, designed to handle C-4 cuts, comprise a total of 14 shells. Following normal design practices, initial Kellogg engineering proposals included three sizes of shells. However, further study by Kellogg engineers proved, in this instance, that it would be most economical in the long run to design the entire group of 14 shells for interchangeable bundles. Both proposals were submitted, the customer agreeing that the interchangeable bundle plan best served their purposes.

Each of the 14 sections are of floating tube sheet construction with 2040 square feet of ¾-inch admiralty tubes, naval brass tube sheets, and steel baffles. Inside diameter of each shell is 33 inches.

Interchangeable bundles for this many sections will offer several important advantages to the refiner. They will, for example, cut down considerably on refinery maintenance stock, since only one spare bundle need be kept in stock to service any one of the 14 sections. Shorter down-time for repairs are also expected to result from the fact that the spare bundle can be substituted easily in an emergency without shutting the unit down for lengthy repairs or rebuilding.

For further information, details of methods, etc. contact

FABRICATED PRODUCTS DIVISION
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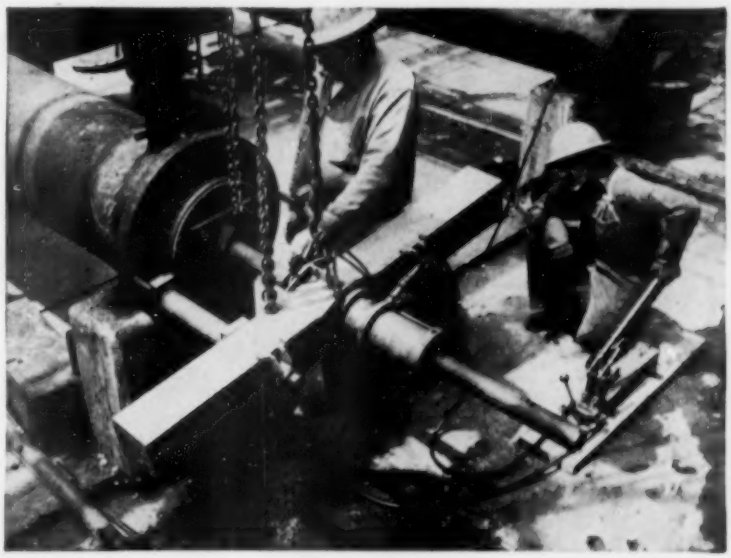


Portable Bundle Puller Saves Time Eliminates Costly Rigging

Shown here in use at a major Eastern refinery is Kellogg's special device, known as the Hydro-ejector, for removing and inserting heat exchanger bundles.

The device, portable and easily operated by two men, reduces down-time and eliminates the need for "jerry-built" rigging often required to pull even the smallest tube bundles. From the standpoint of time, experience has shown that it takes less than 25 minutes for the device to push a tube bundle out eight feet.

And even the largest bundles will not stick when pushed by the force of 12,000 pounds that may be exerted by the Hydro-ejector. The device is attached directly to the bonnet-end shell flange of the exchanger. It does not pull a bundle; it pushes it.

The Hydro-ejector is safer to use—particularly in the case of overhead exchangers—because workmen do not have to clamber out on the bundle after it is partly pulled to attach hoists. Ropes for lowering the bundle are attached as it is ejected and ride along with the unit from a trolley on the hoisting beam.

The Hydro-ejector will fit any size exchanger. Although now available for use in existing refineries, the unit was originally designed for customary types of exchangers in new processing plants as a means of reducing investment for supporting steel work. In cases where more than one Hydro-ejector is used, all parts including the jack and pumping unit are interchangeable. The only auxiliary equipment are two hoists, suspended at the channel end of the exchanger, to handle the tube bundle as it is ejected or replaced.

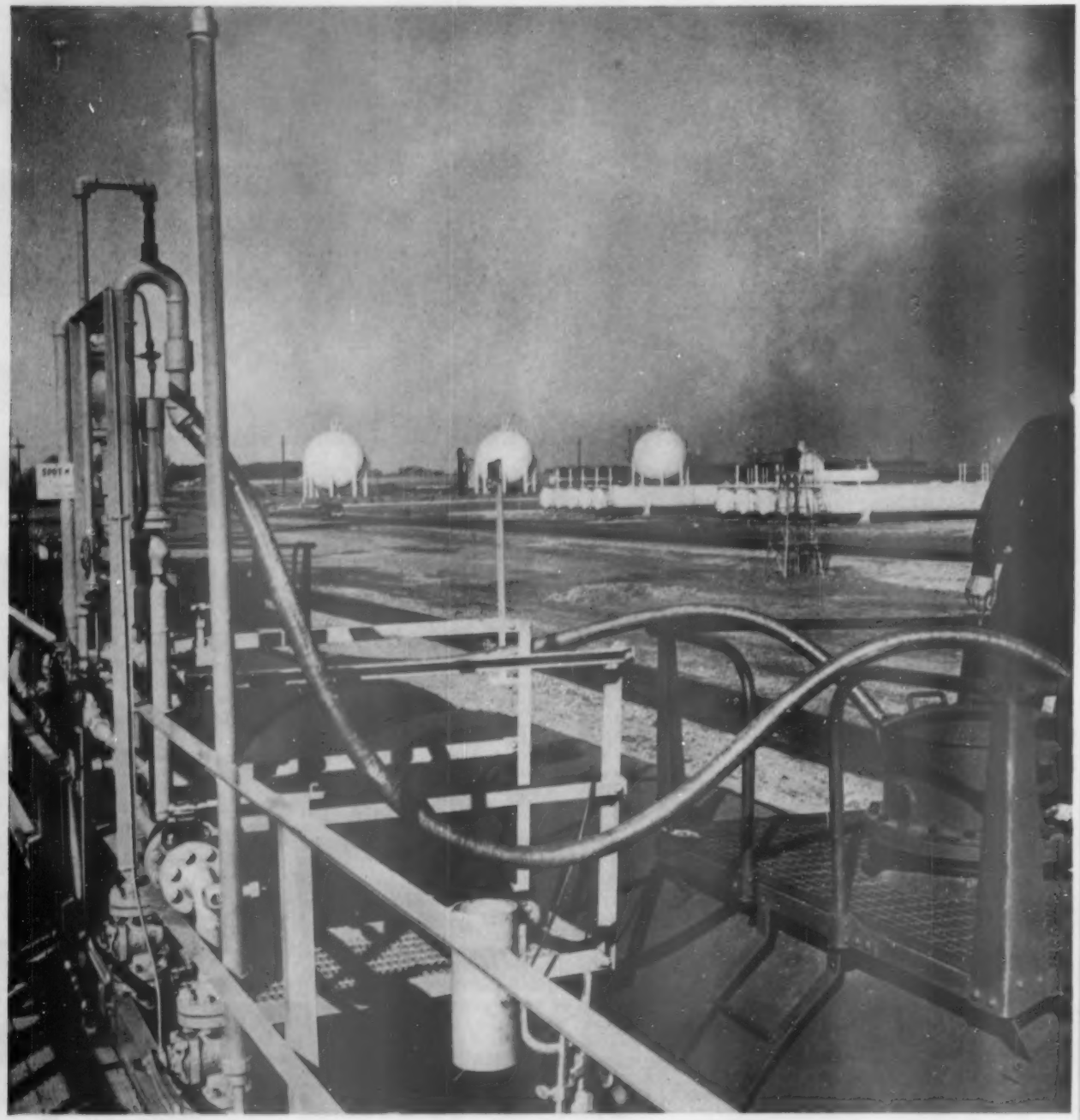
In operation, two men may work it with ease. One is required to pump the jack while the other keeps an eye on the bundle to ensure alignment.

Each unit consists of a hydraulic center-hole jack, supported by a fabricated steel base which is bolted directly to the exchanger. It is self-contained and portable, the heaviest piece of equipment being less than 75 pounds.

Send for New Booklet On Kellogg Exchangers

A new booklet which describes in detail the types of tubular heat transfer equipment available from Kellogg has just been completed. It not only shows examples of a variety of heat exchangers, coolers, condensers, reboilers and other process equipment, but also covers in some detail the expanded facilities available at Kellogg since the shops were modified for production-line manufacture of heat transfer units.

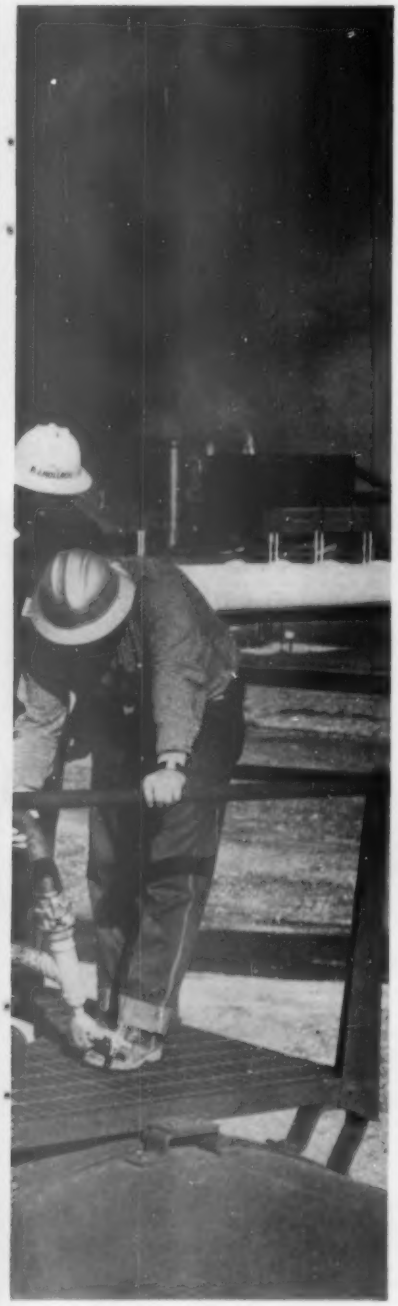
Here's 1412 feet of Maltese



HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Cross Propane Hose at Work!



At this new plant of the National Petro-Chemicals Corporation at Tuscola, Illinois, 113 lengths of Hewitt-Robins Maltese Cross® LP-Gas Hose are used to load propane and other hydrocarbons at the rate of 27 tank cars and 30 tank trucks per day. To insure steady production, eliminate chance of costly breakdowns, the engineers who designed and built these loading racks specified Hewitt-Robins Maltese Cross Propane Hose equipped with Hewitt-Robins couplings because it's stronger . . . safer . . . tougher . . . resists penetration of liquefied petroleum gases . . . is easier to handle!

Whether you're handling liquids or gases, Hewitt-Robins can benefit your operation with maximum hose safety, economy and performance. We manufacture over 1,000 types of industrial hose; there's one to meet your need!

ENGINEERING DATA

MALTESE CROSS PROPANE HOSE —Synthetic Tube and Cover, Braided, Mandrel Cured.

TUBE: Thick, compounded synthetic, specially formulated to resist permeating action of liquefied petroleum gases.

CARCASS: Strong, braided rayon cord, impregnated in resilient synthetic rubber, closely braided at correct angle to withstand highest pressures. Spiral of non-corrosive wire in the hose wall dissipates static. Positive electrical connection is assured by factory testing every length.

COVER: Tough, tan weather- and abrasion-resistant. Will withstand prolonged exposure to sunlight and abuses common to propane service.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
Sea Loading
Servall®, All-Service
Steam
Tank Car & Tank Truck
Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

•

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber Products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

4292

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

• We put the piping inside, out of the cold... and solved the problem of Treater Operation in COLD Climates

PARKERSBURG
Winterized Treaters

Putting the piping inside the treater has brought about important advantages that solve the problems of treater operation in cold climates and resulted in more efficient performance in any weather.

Radiation loss is substantially reduced because inlet and discharge pipes are inside and rise to the top of the treater.

Discharge water is protected from freezing because weir box and discharge pipe are inside the treater.

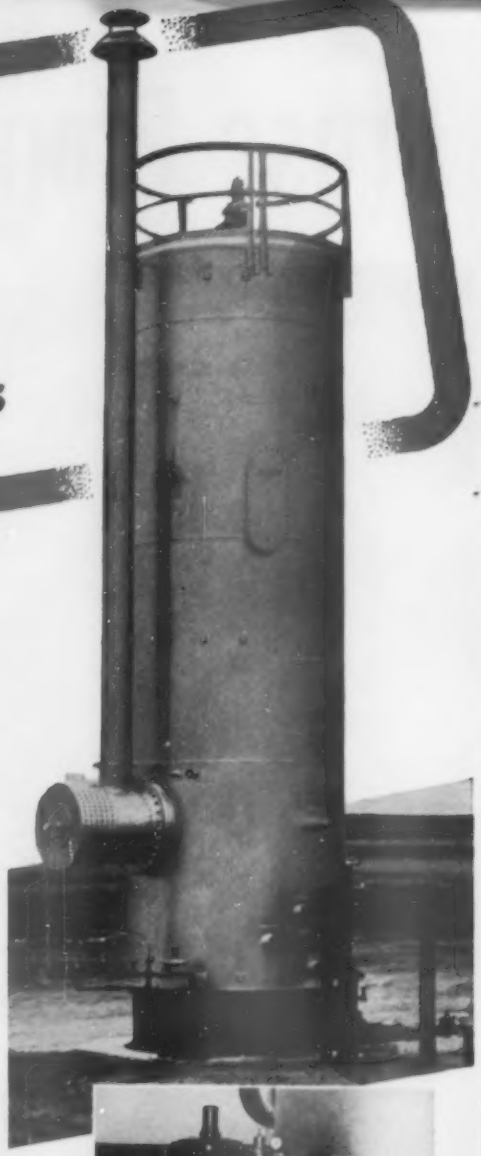
All connections are grouped close to the firebox which not only simplifies hook-up, but makes it easy to house the controls for protection against cold weather.

Additional pre-heating of the incoming emulsion takes place as it travels from bottom to top of treater through a pipe in the hot water and oil.

Increased water capacity with less heat loss to the water has been achieved by a rearrangement of the fire tube.

Internal heat exchanger can be furnished to enclose the emulsion inlet and clean oil outlet piping. Outside heat exchanger and pre-heaters are also available.

• ***Ask your Parkersburg Representative about the solution to emulsion treating problems in cold climates with a Parkersburg Winterized Emulsion Treater.***



• Note the grouping of connections, valves and controls near the fire-box and at ground level. They are easily and economically housed for protection against weather.

5426

THE PARKERSBURG RIG & REEL COMPANY • PARKERSBURG, WEST VIRGINIA

Division of Parkersburg-Aetna Corporation

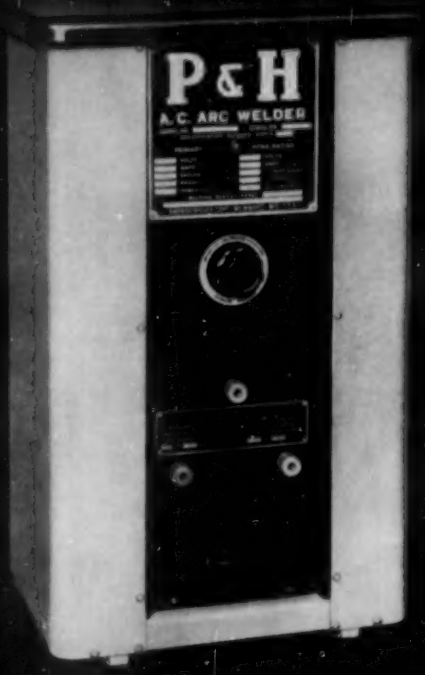
PRESSURE EQUIPMENT

SEPARATORS • HYRECO • DEHYDRATORS • KNOCKOUTS • SCRUBBERS • TREATERS • HEATERS

For Intermittent Service
You Can't Beat this Welder

You Can't Beat its Price

You Can't Beat
its Performance



New P&H TI-295 295-amp AC Welder

...the only low-cost intermittent-type welder that can handle low-hydrogen and stainless-steel electrodes

Here's a low-cost welder—with a rated load and duty cycle as follows: 295 amps, 20%; 250 amps, 30%; 200 amps, 50%.

Wide Range — You can go from 25 amps to 295 amps. You can use this machine on light-gauge material, as well as on heavy plate.

No Arc Booster — Just think — you get an open-circuit voltage of 75 volts. This means — you can weld with low-hydrogen or stainless-steel electrodes. No other welder that sells for the low price of the TI-295 can do this. Arc-striking is easier and electrode-sticking eliminated.

Exclusive P&H Dial-lectric Control — You get sound, uniform welds because all you have to do is turn a radio-like knob to get exactly the heat you need. The amperage adjustment is creep-proof too — you set the heat and it stays. Changing heat is only a matter of a second or two — a three-quarter turn of the knob is all that's required to go from minimum to maximum capacity.

No hard-to-work crank to turn. No moving parts — no moving coils or cores, no worm gears or sprockets, chain or lever adjustments. This means there's less wear, less maintenance, *less noise*—nothing to bind or "freeze" from rust.

Contact your P&H representative or distributor — see how easily the new P&H TI-295 outperforms other welders in this class.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4527 W. National Ave., Milwaukee 46, Wis.

the P&H Line

P&H Welding equipment is manufactured and sold in Canada by
REGENT EQUIPMENT MANUFACTURING COMPANY LTD. • 455 King Street West • Toronto, Ontario, Canada

Only Brown flow meters offer you these profitable "*plus*" *values*

- ***16 different types*** of basic instrument systems . . . a flow meter for every fluid, every pressure, every operating requirement. *You're sure to find the most profitable meter for your specific application.*

- ***Nearby service facilities.*** There's a Honeywell service center as near to you as your phone. Service by factory-trained specialists is prompt, competent and economical. *You're sure to get maintenance and start-up service without delay.*

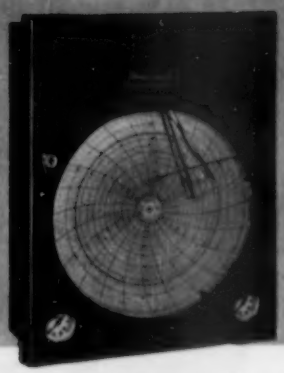
- ***27 years of experience*** in flow metering development and application work. *You're sure to get specialized engineering on your flow metering problem.*

- ***Nationwide field organization.*** Brown flow metering consultation is available from experts in more than 90 field offices, located near every major production center. *You're sure to have application engineering on hand where and when you need it.*

Linear scale meters—mechanical or electrical types, all control forms.

Square root scale meters—mechanical, or electrical or pneumatic transmission . . . all control forms.

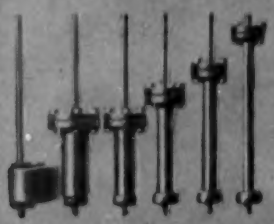
Portable meters—versatility, for spot checks of flow values not continuously recorded.



Low pressure meters—either electrical or mechanical type, for air or gas flow.

Differential Converter—mercury-less pneumatic flow transmitter with infinitely adjustable range.

Area Type Meters for measuring flow of viscous fluids . . . electrical transmission.



Interchangeable range tubes typify rangeability of all Brown flow meters.

NOTE:
Tel-O-Set miniature instruments and *ElectroniK* indicators, recorders and controllers are available for use with all flow transmitters.

a flow meter for every fluid...

every application (all available with electronic integration)

In performance, too, Brown flow meters provide you unsurpassed precision . . . reliability . . . convenience . . . with minimum maintenance requirements. In every way, you'll find it pays to select your flow meters from the one line that offers the most value.

Your nearby Honeywell sales engineer will be glad to discuss your specific flow application . . . and he's as near as your phone.

Minneapolis-Honeywell Regulator Co., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA: Write for new Catalog 2320, "Flow Meters, Indicating, Recording, Integrating, Controlling."**

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

HAMMOND ANNOUNCES ITS TUBESEAL* SYSTEM FOR FLOATING ROOF TANKS

new or old—riveted or welded

THE MOST EFFICIENT AND POSITIVE SEAL KNOWN

1 no moving parts
2 no mechanical maintenance
3 overcomes tank out-of-roundness
4 climate proof
5 non-corrodible
6 can operate to bottom of tank or above the top
7 no vapor space below the seal
8 entire circumference has tight seal under pressure at all times

Conceived years ago but only made possible by combining HAMMOND ENGINEERING and MODERN MATERIALS

Thoroughly TESTED in commercial installation • GUARANTEED to your satisfaction

Note free appearance of roof

Looking up on underside of seal

*Copyright

ask for Bulletin TS

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WARREN and BRISTOL, PA. • PROVO, UTAH
CASPER, WYO. • BIRMINGHAM, ALA.

Sales Offices: NEW YORK 20 • AKRON • BOSTON 10 • BUFFALO 2 • CHICAGO 3 • CINCINNATI 2 • CLEVELAND 15
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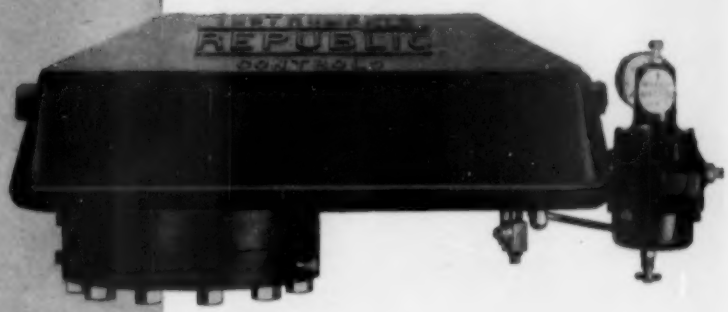
COMBINES MACHINE RUGGEDNESS WITH INSTRUMENT PRECISION for dependable low maintenance metering

REPUBLIC

pneumatic transmitter for measuring FLOW, PRESSURE, LEVEL or DENSITY...



Machine dependability with instrument accuracy and sensitivity! Think what this combination of features can mean in your plant—less maintenance, longer life for lowest "long run" cost, *continuous* accurate operation.

You get all of these benefits and more with the Republic Pneumatic Transmitter. Force-balance operation permits the use of strong rugged parts with no sacrifice in accuracy or sensitivity. Gives exceptional overrange protection.

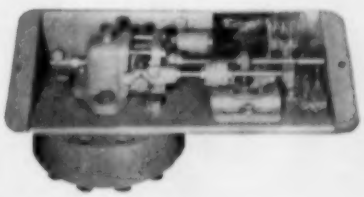
Housed in a durable metal case, the transmitter may be adjusted for mounting at any angle, indoors or out. Its accuracy is not affected by changes in ambient temperature vibration, normal changes in supply air pressure or inaccurate leveling. Uses no mercury or purge pots. Can be used with very viscous fluids.

The Republic transmitter isolates fluids to a measuring chamber which may be supplied in a variety of corrosion resistant materials. It sends an air pressure proportional to fluid flow, pressure, level or density to reading instruments or for actuation of an automatic controller.

Republic Pneumatic Transmitters are proving their superiority in hundreds of chemical and oil field applications. Investigate their advantages for you — write for your free copy of 36 page Data Book No. 1004.

SPECIFICATIONS:

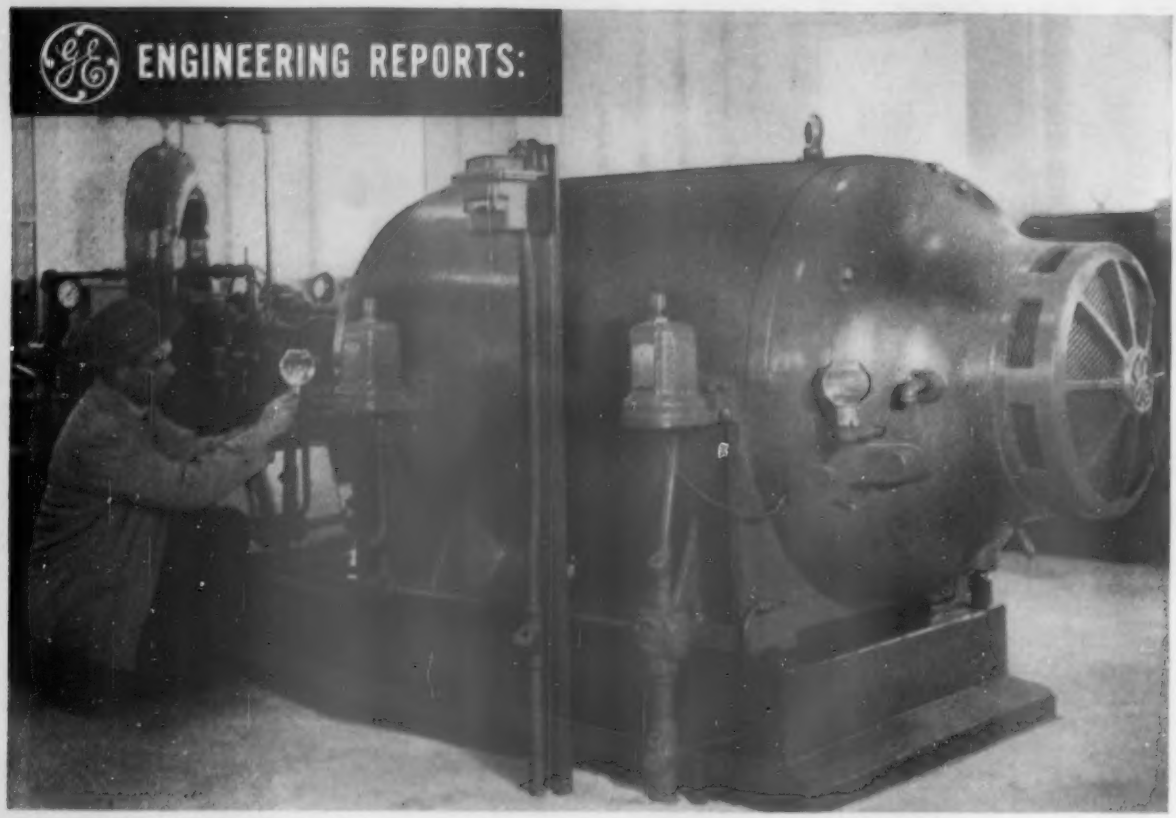
ACCURACY — ½% of maximum range guaranteed for standard models.
DIFFERENTIAL RANGES — Any desired span between 0-0.6" H_2O and 0-750 psi at operating pressures of 15 psig to 2000 psig.
PRESSURE RANGES — Any desired span between 0-1" H_2O and 0-2000 psig.
LEVEL RANGES — to meet almost any application.
DENSITY RANGES — 0.15 sp. gravity spread for 3 to 15 psig output pressure from any base density.
Extremely wide range change is possible without change of parts. Ranges may be easily changed, suppressed, compounded or reversed.



● ***EASILY SERVICED*** Cover can be completely removed for access to all range adjustments and replaceable parts. No special tools required.

REPUBLIC FLOW METERS CO.
2240 Diversey Parkway, Chicago 47, Illinois

ENGINEERING REPORTS:



LOWER STATION CONSTRUCTION COSTS were possible because use of three G-E explosion-proof motors eliminate need for an intervening firewall. Bearing temperature relays mounted on motors' sides help protect them against overheated bearings. These motors are built to require a minimum of maintenance at the pumping stations.

G-E engineering services cut planning time,

RELIABLE STATION PROTECTION is provided by G-E metal-clad switchgear using magne-blast air current breaker with adequate interrupting capacity.

SPACE-SAVING G-E safety switches and combination starters in control room, control air compressor, sump pump, and deep well motors.

3-WAY EXTRA PROTECTION against physical damage, electrical breakdown, and operating wear is built into vertical Tri-Clad* motors.

*Reg. trade-mark of General Electric Co.

SIMPLIFIED STATION CONTROL is possible with this G-E operator's console. Its explosion-proof emergency-trip push button can shut off at once every power source in the control room.

INSTALLATION COSTS WERE REDUCED with G-E factory-assembled 2300-v indoor metal-clad switchgear. Unit controls and helps protect main pumping motors.

speed installation of new Buckeye stations

General Electric Application Engineers co-ordinate electrical system, Field Engineers expedite start-up of Lehighton, and Nicholson, Pa. stations

Maximum safety precautions, minimum maintenance, high functional dependability—these were specified as "musts" for the electric equipment in two new pumping stations of the Buckeye Pipe Line Co. That's why General Electric Application Engineers were called in early in the planning stages of Buckeye's Lehighton, and Nicholson, Pa., stations.

Working closely with Buckeye's engineers, and contractors and consultants, Pipe Line Engineering Co., these G-E engineers helped develop a co-ordinated electrical system that economically met all the specifications. And G-E Field Engineers, on hand for the installation, helped speed a smooth start-up.

Now with the line in operation from Linden, N. J. to Auburn, N. Y., Buckeye reports complete satisfaction with performance of the electrical system, and the G-E engineering services used at these stations.

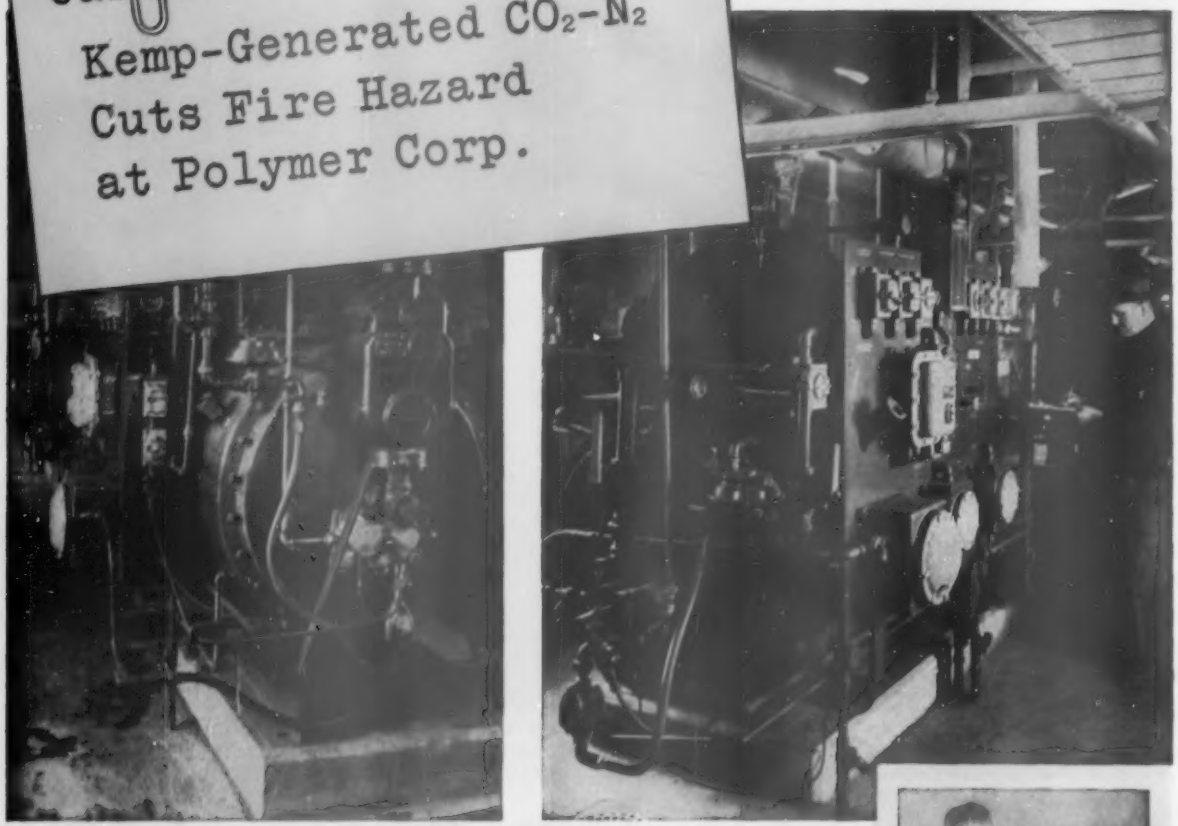
Whatever your pipeline electrification needs, G.E. can provide a broad line of motors, control, and power-system equipment—co-ordinated for maximum efficiency. And no matter where your pipelines run, G-E service facilities nearby can help you keep your equipment at peak performance levels. For more information, contact your local G-E Apparatus Sales representative, or send for 40-page bulletin GEA-5423 on electrified oil pipelines to General Electric Co., Section 661-46, Schenectady 5, N. Y.

Engineered Electrical Systems for Oil Pipelines

GENERAL ELECTRIC

Case No. 62

Kemp-Generated CO_2-N_2 Cuts Fire Hazard at Polymer Corp.



How Polymer operated day and night for 10 years at maximum safety

When Polymer Corporation, Ltd., Sarnia, Ontario, began operations in 1943, inventory included two Kemp MIHE Inert Gas Generators. Since that date, Polymer—and its Kemp equipment—has been operating 24 hours a day, 365 days a year. The huge quantities of man-made rubber and associated chemicals it produces—200,000,000 pounds during one year alone—reach, in one form or another, the four corners of the world.

Kemp Plays an Important Role

The high volatility of many of the ingredients used in this giant operation necessitates blanketing and purging vessels after use. It is in this step that Polymer employs Kemp Generators to assure safe, trouble-free performance. The gas they produce is piped to different operations over the entire company area—it *must* be clean! Kemp does the job—Polymer knows that it can depend on Kemp to deliver a *clean inert at a specific analysis, regardless of demand*. And every Kemp Generator is engineered for fast starts and easy operations that save *time* and *money*.

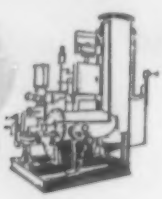
Kemp Can Do a Job for You

Kemp superiority is no accident. It is based on years of experience . . . on quality of design to meet specific problems. Every Kemp design features the Kemp Industrial Carburetor for complete combustion without tinkering or waste . . . for simplified installation and maintenance. Every Kemp design includes the latest fire checks and safety devices. If you have a blanketing or purging problem, contact Kemp engineers. They will be glad to study your situation and recommend the installation best suited to your needs. No obligation, of course.

Gas generator building from which inert gas is piped over 130 acres of company property at Polymer's Sarnia, Ontario, operation.

For more complete facts and technical information, write for Bulletin I-10 to: **THE C. M. KEMP MFG. CO., 405 East Oliver Street, Baltimore 2, Md.**

KEMP OF BALTIMORE



INERT GAS GENERATORS

CARBURETORS • BURNERS • FIRE CHECKS
METAL MELTING UNITS • ADSORPTIVE DRYERS
SINGEING EQUIPMENT

9,896 small businessmen help us serve you well

Back in Grandpa's day, horse-drawn tank wagons like this delivered Pearl Oil Kerosene and Eureka Harness Oil to Standard customers. It was a delivery system good enough for the times—but not good enough for a company with a growing demand for its products and a policy of putting them within reach of everyone.

8,329 Independent Chevron Dealers like Jim Davenport, of Phoenix, Arizona, bring Standard's products to motorists.

725 Independent Distributors, like H. G. Hathaway, of Grants Pass, Oregon, distribute our products in rural areas.

188 Independent Marine Dealers like Ted Engstrom, of Olympia, Wash., retail Standard products to Western boatmen.

235 Independent Heating Oil Dealers like F. L. "Doc" Howard, Boise, Idaho, are retailers of Standard Heating Oils.

101 Independent Liquified Gas Dealers like Fred La Frentz, Cedar City, Utah, distribute butane and propane gases.

318 Independent Airport Dealers like Howard S. Fisher, San Diego, Calif., supply Standard products to Western planes.

Ever hear the one about big companies "squeezing out the little fellow"? You'd have a hard time convincing these 6 men—or the 9,890 independent businessmen like them who team with us to bring you Standard Oil Company of California products quickly, conveniently, economically. They form the nucleus of a distribution system that reaches every corner of the West. Each of these men operates his own independent company; together they employ 27,976 people. You probably know some of them because they contribute to the community life and prosperity of thousands of Western towns. Their undertakings are not only based upon Standard products, but operated and expanded with the help of scores of business aids Standard supplies without charge. We do all we can to help them prosper for Standard knows a big company can't succeed without the help of small businessmen. It takes both to serve you well.

STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better

IT PAYS TO USE THE BEST

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OXWELD rods, fluxes, and accessories will consistently give superior performance in any welding shop. For they are backed by LINDE's 45 years of research, development, and practical experience in oxy-acetylene welding and cutting processes. Always look for the OXWELD brand. It is your assurance of getting highest quality products.

Free!

"Helpful Facts About Oxwelding Rods and Supplies"

Get your copy of this 32-page booklet from your LINDE jobber today. Or write to LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

GET IT FROM YOUR

LINDE jobber

The terms "Linde" and "Oxweld" are registered trademarks of Union Carbide and Carbon Corporation.

OXWELD RODS

are manufactured under rigidly controlled conditions to give top performance in any welding shop. Only five types of OXWELD rods are necessary for all average welding jobs.

OXWELD FLUXES

make it easy for you to get high quality welds every time. They provide a chemically clean surface and assure thorough fusion of rod and base metal during welding.

OXWELD GOGGLES

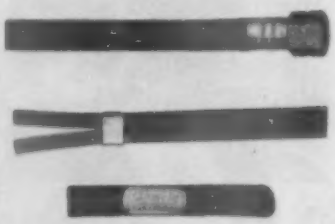
are built to give maximum eye protection with excellent visibility free from eyestrain and fatigue. Three shades of lens coloring are available to meet individual needs.

OXWELD GLOVES

furnish full protection for wrists and forearms as well as hands. Made of tough, flame-resistant suede leather, they are unusually soft and comfortable.

OXWELD HOSE

is available in single and double styles and in fitted lengths. It is light, durable, flexible, and practically immune to deterioration from sun and weather.



OXWELD

Friction Lighters

Tip Cleaners

Wire Brushes

for efficient welding and cutting operations.

'ROUND THE CLOCK...
ALL YEAR 'ROUND

Refinery operations are a grueling test of the design and construction of the various complex production units. The continuous, trouble-free performance required of these installations demands that they be engineered right . . . built right.

Pritchard engineers have a well-deserved reputation for cooperating closely with our clients' engineering staffs. This integration produces refinery installations of practical, efficient design that pays off in economical production and Pritchard construction engineers have proved over and over again their exceptional ability at putting these installations on stream on time.

Engineered right . . . built right! Two good reasons to choose Pritchard for *your* next refinery installation.

Industry's Partner for Progress

J.F. Pritchard & Co.

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FIRE!

Put it out in seconds with a Kidde portable extinguisher!

When fire strikes, there's just one thing to do – Put it out *fast!* That's why it's so vital to have Kidde portable extinguishers near every fire hazard . . . because Kidde portables, with their special fast-acting trigger release, are made to swing into action at a moment's notice.

You just grab a Kidde CO_2 or Dry Chemical portable, aim the horn, and pull the trigger. Whoof! The fire's smothered right in its tracks!

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Don't wait – Contact Kidde today!

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Kidde

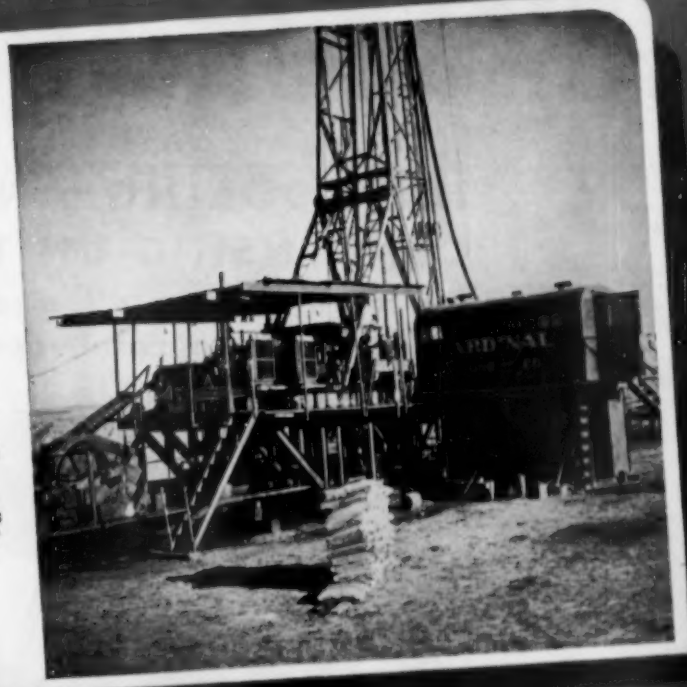
Walter Kidde & Company, Inc., 1054 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, Toronto

GM DIESEL
CASE HISTORY No. 538-1Y

USER: Cardinal Drilling Company, Bismarck, N. D.

INSTALLATION: Two GM "Twin 6-71" Diesels replaced four gas engines in February 1953, driving PBM 36 Emsco drilling rig and mud pump.

PERFORMANCE: Drilling Superintendent Charles Spaulding reports he's cut fuel costs 49%, cut maintenance costs 25% and boosted production 25% since he switched from butane to GM Diesel power. GM Diesels also eliminated the problem of fuel freezing in the lines when drilling in 30° - 40° below zero weather.



It Pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

Drills Faster—Cut Fuel Costs 49%

Since He Switched from BUTANE to General Motors Diesel

Here's a new General Motors Diesel economy story: Although butane cost this drilling contractor about 5¢ less per gallon than Diesel fuel, he switched from an LP gas engine to General Motors 2-cycle Diesel power—*and cut fuel costs 49%!*

GM Diesels cut fuel consumption by 335 gallons per 24-hour day—boosted production 25%. Because GM Diesels are built for this kind of work, his maintenance costs dropped 25% in the first 8 months. He is also no longer bothered with fuel freezing in the lines.

Producing more power from smaller, lighter Diesel units, quick-starting GM 2-cycle Diesels let drillers make faster moves without special road permits. GM Diesel distributors back up engine performance with fast service and quick delivery of low-cost parts. As Drilling Superintendent Charles Spaulding says, "I'm usually drilling in pretty isolated territory but no matter where I drill, I'm close to GM Diesel service." For more information see your GM Diesel distributor or write:

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines...30 to 300 H.P. Multiple Units...Up to 893 H.P.

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 PHILTOWER BLDG., TULSA, OKLAHOMA

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ARMSTRONG EQUIPMENT CO.

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WEST COAST ENGINE & EQUIPMENT CO.
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ANDERSON-O'BRIEN CO.
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GEM EQUIPMENT CO.

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SWEENEY BROTHERS

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"HC" horizontal core COOLING AND CONDENSING UNITS

for cooling water, oil, gases condensing steam and vapors

AUTOMATIC AND MANUALLY OPERATED SHUTTERS . . .
Pressure, vacuum or electric driven, conserve power under all operating conditions.

STURDY CORE GUARD SCREEN
Protects coil sections from falling objects; standard equipment on Units without shutters.

HEADERS AND TANKS
Fabricated steel tanks treated for corrosion resistance for every type of service. Coils designed for easy access to tube ends.

LARGE, DEEP PLENUM CHAMBER
Provides greater depth for even air distribution. Rigidly constructed of heavy gauge sheet steel and angle iron channels.

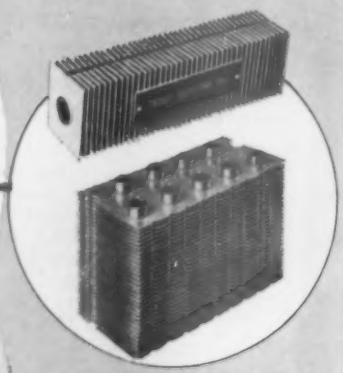
TOTALLY ENCLOSED FAN-COOLED BALL BEARING MOTOR
Includes squirrel cage; 3 phase, 60 cycle, at 220 V. Totally enclosed fan-cooled motors for belt driven Units.

STANDARD V-BELT
Standard sizes of V-type belts are used for motors or engine power take-off.

3-10 GROOVE V-SHEAVE PULLEYS
Standard sizes of 3 to 10 groove V-sheave pulleys are used depending upon operating requirements.

Vibration-free Tripod Mountings
Independently mounted fans on special tripods completely eliminate fan vibration, a major cause of core failures.

Young Monofin Core
Provides economical replaceable tube feature. Available in copper, brass and admiralty metals.



Tube and Plate Fin Core
Coils supplied for any operating pressure. Available in plate fin, monofin or spiral fin construction.

Young HC Units combine the . . .

Efficiency of vertical air discharge

Economy of compact Young design

Versatility of multiple unit combinations

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Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

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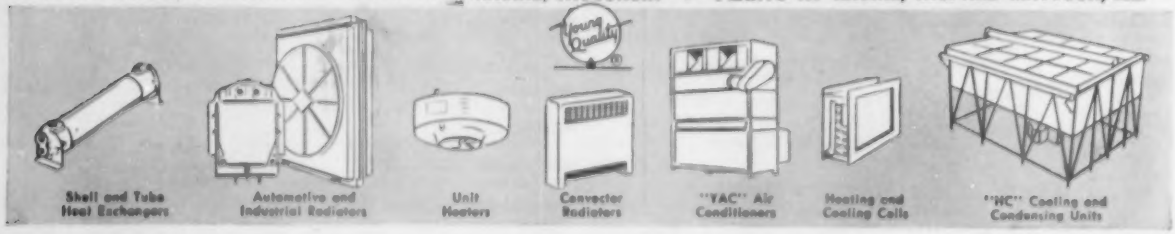
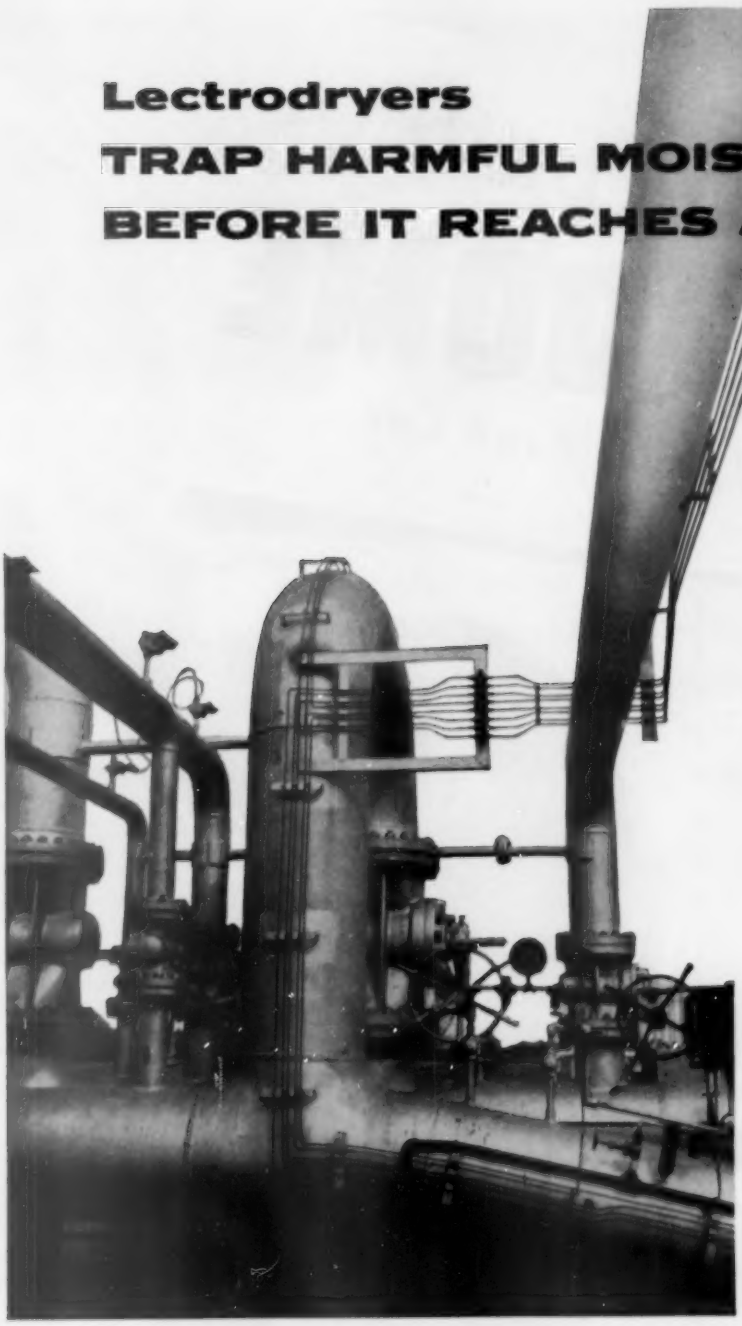
Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 204-K RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.



Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

Lectrodryers
TRAP HARMFUL MOISTURE BEFORE IT REACHES AIR LINES



DRY air protects against freeze-ups and prevents harmful moisture from causing sludge or rust that may clog delicate instrument orifices. DRY air insures a clean, free flow to finely balanced controllers, valves and instruments . . . actually reducing maintenance problems.

Prevent harmful moisture condensation in air lines and obtain a flow of clean, DRY air by installing a Lectrodryer* and a Lectrofilter* at your air compressor. The filter frees the air of oil and grime after it leaves the compressor. The Lectrodryer continuously and automatically DRYs the air to dewpoints as low as −100°F, depending on your need.

Investigate the new "BY" Lectrodryers. They're designed especially for instrument air service. They contain no moving parts, assuring minimum maintenance. And their DRYing adsorbent, Activated Aluminas, will not wear out.

Write for the booklet *Because Moisture Isn't Pink.* It describes Lectrodryers and how industries are using them. We will welcome any inquiry you might have regarding DRYness engineering. Pittsburgh Lectrodryer Corporation, 325 32nd St., Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U. S. PAT. OFF.

acf built — The DURADOME

Flued Dome Tank Car

improved 4 ways

1. ***Flued Dome*** . . . dome base actually pressed out of heavy steel plate — eliminating fillet welds and dome shelf. This results in greater structural strength — more resistance to corrosion — greater ease of cleaning — better application of lining.

2. ***Pressure-type Construction*** . . . uses complete "ring-sections" or cylinders to build up the tank. That means heavier steel *all* the way around . . . far greater strength, durability, and protection for costly ladings. Tank tested at pressures well above I.C.C. specifications.

3. ***All-welded Insulation Jacket*** (when required) . . . Completely welded jacket eliminates all angles and bolts. Streamlined and better looking — easier to keep clean — more weatherproof — needs less maintenance.

4. ***Standardized Underframe***—the same, all-welded underframe for tanks of all standard types and capacities. Provides greater flexibility of use — standardizes repair procedures for simpler, more economical maintenance.

Biggest News in tank cars since the all-welded car!

A million-dollar press was needed to make this new car possible! And yet—whether you follow the trend to leasing, or whether you buy—you get DURADOME benefits at *no extra cost*. Stronger... easier to clean... easier to apply lining. Get *all* the facts on the new DURADOME now from your Shippers' representative.

The DURADOME car is available for lease or sale through . . .

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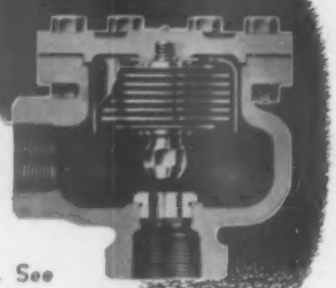
NICHOLSON TRAPS

for every plant application



Send for Nicholson catalog 953. This 32-page standard reference on advance-type trapping of steam, air and other mediums contains: installation diagrams, charts for determining trap sizes, and advice on specific problems. See why leading plants are increasingly standardizing on Nicholson traps for increased production and minimum maintenance: thermostatic (illustrated) and metal expansion for pressures to 250 lbs.; weight and piston-operated, to 1500 lbs.

Send for Helpful Booklet

W.H. NICHOLSON & CO.

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210 Oregon Street, Wilkes-Barre, Pa.

Have you OUTGROWN your pumps?

IF the efficiency of your pumping system has not kept pace with your company's growth, take a new look at Viking Rotary Pumps. It is the most complete line in the field, with sizes from ½ to 1050 G.P.M. Over 700 standard models and thousands of specials . . . the right pumps for most industrial needs. To start, write for folder 55ST.

VIKING PUMP COMPANY
Cedar Falls, Iowa

See Our Catalog in SWEETS

They Say—

Gas Flowing Over the Border

"These two great countries, the U.S.A. and Canada . . . have been an example to the world as to how two great nations can get along in complete harmony side by side while the rest of the world is being torn by war and strife among themselves.

"Realizing that this is not only possible but a reality, surely we can go one more step forward in the interest of the security and well being of these countries by making it possible to use our natural resources in a way that would be most economical and beneficial to the continent as a whole.

"In other words, if it is natural and most-economical for some of our processed natural resources to flow from North to South and from South to North, surely by some arrangement between the two governments a treaty can be worked out whereby both countries would feel entirely safe in relying on each other for source of supply."

N. E. Tanner, president of Trans-Canada Pipe Lines, Ltd., in an address at the New Orleans meeting of the Independent Natural Gas Association of America.

String 'em Up?

"It is plain that offshore drilling is not a business to enter on a shoestring, unless you want to get strung."

L. W. Clark, assistant secretary of Standard Oil Co. of Texas, in an address before the New Mexico Petroleum Industries Committee, Santa Fe.

Management's Miscue

"It seems vital to me that we who are in management develop better ways of explaining business. This is a national problem, but it cannot be solved by some action in Washington or New York. It must be tackled by management everywhere . . .

"Unless we achieve understanding, we seldom achieve faith and loyalty. Here, it seems to me, is where a weakness has developed in American industry . . .

". . . Management has neglected its

Why Camco Now Uses 3 Inco Nickel Alloys

In Retrievable Gas Lift Valves

When this valve was in the testing stage it got the works . . .

And Camco discovered just what to do to assure trouble-free operation under practically any conditions.

Now they achieve an extra margin of safety by taking advantage of the distinctive properties of three Inco Nickel Alloys . . . matching the requirements for each part with the alloy best suited to meet them. Here is what Camco chose . . . and why!

Monel® for bodies, bellows, and other parts subject to the normal abuse of oil wells. Monel is a high-strength alloy with a unique record in resisting attack by sour crudes, brines and acids.

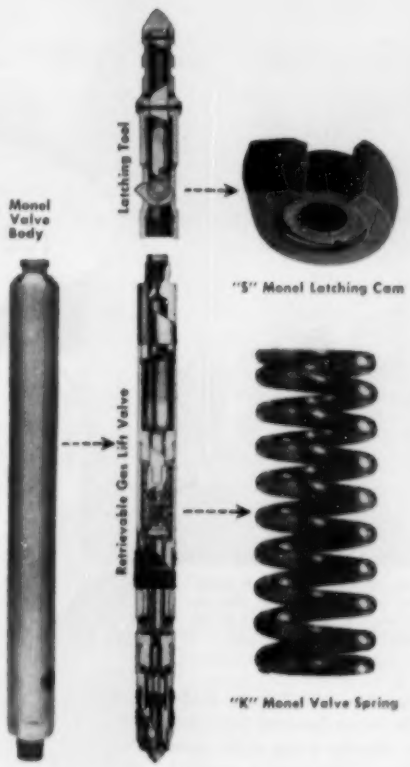
"K"® Monel for the springs. The excellent spring properties of "K" Monel, after age hardening, make it extremely useful in a wide variety of applications which require the corrosion resistance of Monel together with high elastic properties and fatigue strength. For this spring which powers part of the valve action and is the "stand-by" should the bellows fail, "K" Monel is a natural.

Cast "S"® Monel for the latching cams. "S" Monel is Monel with a portion of silicon added to provide extra hardness. A corrosion-resistant metal with great strength and high hardness was needed here since the part must not gall or seize or change shape despite years of exposure to corrosion, abrasion, shock and pull.

Let Camco's experience guide you. Use the specialized qualities built into each Inco Nickel Alloy to give your equipment a high degree of dependability.

Inco's long experience in matching metals to oil field equipment requirements is at your disposal.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.



RETRIEVABLE . . . This unique CAMCO gas lift valve may be installed or removed *without pulling tubing.* A special tool suspended on a wire line latches valves in pockets or pulls them at will without disturbing other valves in the string. For complete information regarding Camco retrievable gas lift equipment, write directly to CAMCO, Inc., 7315 Canal St., Houston, Texas.

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Gas Transmission Company

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Below: Exhaust snubbers and combination air filter snubbers engineered and built for four 1,600 h.p. and eight 2,000 h.p. gas engines at Station #1, Agua Buica, Texas.

Above: Seven exhaust snubbers and seven combination air filter snubbers designed to meet the silencing requirements of seven 2,000 h.p. gas engines at Station #9, Bloomington, Texas.

Proper silencing is one of the keynotes of efficiency. That is the reason Tennessee Gas Transmission Company, operator of one of the major trunk line systems in the country, consulted Burgess-Manning Sound Engineers on their silencing requirements. Over one hundred snubbers were engineered and constructed by Burgess-Manning to eliminate the intake and exhaust noises at compressor stations along the Tennessee line.

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obligation to spread information on how our business system operates, and how the economic welfare of employes is inseparable from the economic welfare of management and owners . . ."

Emile F. du Pont, director of employes relations, E. I. du Pont de Nemours & Co., in an address before the annual Maine State Safety Conference, York Harbor, Maine.

Gas in the Northwest

". . . Although a permit has been granted to pipe natural gas to the Pacific Northwest states, there is no immediate prospect of British Columbia receiving a supply. It is my sincere hope that in the not too distant future we shall see the natural-gas resources of Canada and the United States developed in such a manner that the greatest good will accrue to the largest number of people . . ."

W. C. Mainwaring, president of Pacific Coast Gas Association, in the president's report at the annual meeting held in Vancouver, B. C.

Cost of Reserves

"Between 70 and 80 per cent of the oil being produced today comes from low cost fields discovered around 10, 15, or more years ago when finding costs were less than one-tenth what they are today.

"Each barrel of crude oil produced must be replaced with at least one and one-half barrels of new reserves if we are to stay in business and maintain the security of this nation. Just what it costs to replace the oil currently being produced . . . is a problem which has challenged oil producers and their economists, engineers, and accounts for many years . . ."

James V. Brown, secretary-treasurer of the National Petroleum Council, in an address in New Orleans before the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association.

The Research Payout

"Although it is generally agreed and statistically correct that research pays, a smaller company considering starting a research department should bear in mind several factors.

"The chance that a specific research investigation will result in a large enough financial return to cover its costs is considerably less than even. The over-all profit from research results from an occasional project producing results of such value to more than offset the cost of a number of failures.

"A company initiating a research program should do so fully understanding that a considerable amount of

REFINERY PROCESS NEWS

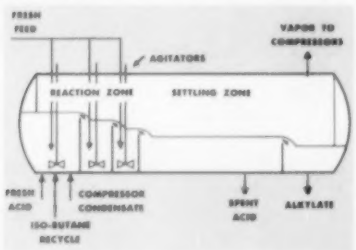
PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY — OCTOBER-NOVEMBER 1954

Special Kellogg Reactor Improves Quantity and Quality of Alkylate

Shown below is a simplified drawing of a typical Kellogg alkylation reactor, the principal feature of which is cascade flow of sulfuric acid catalyst and feed through a reaction zone consisting of three separate sections.

Briefly, in the Kellogg process, the isobutane-olefin feed is introduced into each of the three sections while isobutane recycle and fresh acid is introduced into the first section. During the reaction, which generally proceeds at a temperature between 38° and 40°F., the sulfuric acid drops in concentration due to dilution by moisture in the liquefied gas stream and side reactions with impurities in the feed. The acid is continuously withdrawn as it becomes spent, usually at a concentration of about 90%, though this may vary widely. Fresh acid is regularly introduced to keep the quantity and concentration in the reactor constant. The product of the reaction is passed through a caustic wash and then fractionated at higher temperatures.

One of the chief advantages of the Kellogg design stems from the fact that a 9-to-1 ratio of iso-



butane to butene is maintained in the reaction zones, although the actual ratio of isobutane to butene in the fresh feed plus recycle is only 4-to-1. Consequently, high quality alkylate is produced without adding to pumping and vessel costs in order to handle a large volume of isobutane which would otherwise be required to obtain this very desirable high concentration of the saturate in the reaction zones.

Another advantage is found in

(continued on following page)

The alkylation half of a new cat poly-alkylation combination unit recently completed by Kellogg as part of a major modernization program at a Midwest refinery. The combination unit provides maximum utilization of the light ends from a new Orthoflow cat cracker.

Combining Both Alkylation and Polymerization for Light Ends Processing Shows Many Advantages

The economical upgrading of surplus light refinery gases to more valuable products has been a continuing refinery problem and one which has consequently come in for considerable attention in Kellogg's research and development activities. Out of these efforts have come numerous contributions to the fields of alkylation and polymerization—both of which are now standard processes for converting light hydrocarbons to high-octane, low vapor pressure gasoline components.

Since the feedstocks required for these two processes are supplied by the refinery gas stream, they have usually been considered competitive to some degree. Each, of course, must be analyzed in the light of the particular situation in question and the results to be achieved. But while some circumstances would seem to call for alkylation and others for polymerization, economic studies — which have been supported by a number of recent refinery installations — have shown that in many instances the two processes are complementary rather than competitive. And in those cases where alkylation and polymerization have been combined, the advantages of the resulting processing scheme have far exceeded what could be expected from individual installations of either process.

Low Cat Poly Conversion Improves Alkylation Feed

For example, in a typical alkylation-polymerization operation, the combined C-3 and C-4 stream can be passed first through the poly unit under low conversion conditions (using a lower temperature and a higher space velocity than under normal conversion operations) so that a quantity of unsaturates remain unconverted. These unsaturates are sufficient to alky-

(continued on following page)

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DECARBONIZING DESULFURIZATION

(continued from previous page)

Advantages...

late all of the available refinery isobutane in the subsequent alkylation step. Moreover, the low conversion conditions selectively convert the propylene and isobutene (the latter an undesirable component for alkylation purposes) to polymer gasoline, and isomerize butene-1 to butene-2. The unreacted stream from the polymerization unit thus not only contains a good ratio of isobutane-butene, but the butene, being the "2" isomer, is most effective for alkylation feed.

Several advantages result from combining polymerization and alkylation in this manner. *First*, all refinery isobutane is converted to alkylate and upgraded in value to the maximum extent. *Second*, the refiner is able to further increase his gasoline production through vapor pressure blending with less volatile normal butane and *third*, less severe polymerization appreciably increases catalyst life, reducing operating costs.

(continued from previous page)

Special Reactor...

the cascade flow of acid and feed from the first section onward. Fresh acid, charged to the first section, flows through the other two sections before entering the hydrocarbon-acid settling portion of the reactor. Since the olefin-isobutane reaction is a very rapid one, it is completed in the reaction sections while the acid concentration is still relatively high. This also contributes to higher quality alkylate.

For further information, technical data, etc. on any refining process, write

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KELLOGG PULLMAN

This is the new catalytic polymerization unit which is integrated with the alkylation unit pictured on the previous page and now operating at a Midwest refinery.

Kellogg Developments Reduce Cost of Catalytic Polymerization

As an original member of the Polyco Group, Kellogg has been intimately associated with the development of the cat poly process from its beginning.

In this process, polymerization of light, unsaturated hydrocarbons is accomplished in the presence of a catalyst under moderate temperature conditions (up to 500°F.) at pressures up to 2000 pounds. Under these conditions, the paraffin hydrocarbons in the stream are not converted to olefins. They consequently pass through the unit unchanged so that they are available for a subsequent alkylation step or for some other use. By the elimination of any cracking action in the process, the quality of the product can be closely controlled. Lower initial costs of installation and lower operating costs are also important factors in favor of catalytic polymerization.

Kellogg has contributed even further toward greatly reduced initial costs by building units, wherever possible, that utilize soaking drums from outmoded thermal cracking units. And in its continuing efforts to reduce daily operating costs, Kellogg has perfected a long-life catalyst that appreciably lengthens on-stream runs.

This catalyst, copper pyrophosphate, was developed in Kellogg's Jersey City, N. J. laboratories. Unlike other polymerization catalysts, which tend to agglomerate quickly under the pressures utilized in the process, the Kellogg catalyst retains its original pelleted form and resists softening to a high degree.

Process Adaptable for Other Products

In addition to polymerizing propylene and butylenes in the refinery gas stream to make high-octane blending gasolines, special feedstocks may be utilized in substantially the same equipment and with the same catalyst to produce other valuable products such as cumene from benzene and propylene.

money may be spent and much time may elapse before the venture is financially successful."

Dr. Gustav Egloff, research director of Universal Oil Products Co., in an address at the American Chemical Society meeting in New York.

Threat of More Control

"It was no chimera that Paul Kayser, president of the El Paso Natural Gas Co., was seeing when he warned . . . that complete federal control of the oil and gas business is so close that producers soon will feel its hot breath on their necks. He had not only the trend of recent events, but a specific case to back his statement.

"The Federal Power Commission . . . has been asked to compel producers in the LaGloria field of Texas to deliver gas to a pipeline for transmission to consumers in the Chicago area—to force producers to sell gas they otherwise would not sell. . . .

"The Supreme Court decision opened the door to the dire consequences to the oil and gas industry and its freedom of enterprise, and to state regulatory authority. . . .

"That door can be closed only if Congress throws against it the weight of its authority to make public policy. The arguments for it to do so are extremely cogent. They involve the preservation of private enterprise in a highly import field and preservation . . . of a highly important natural resource."

Editorial in the Fort Worth Star-Telegram.

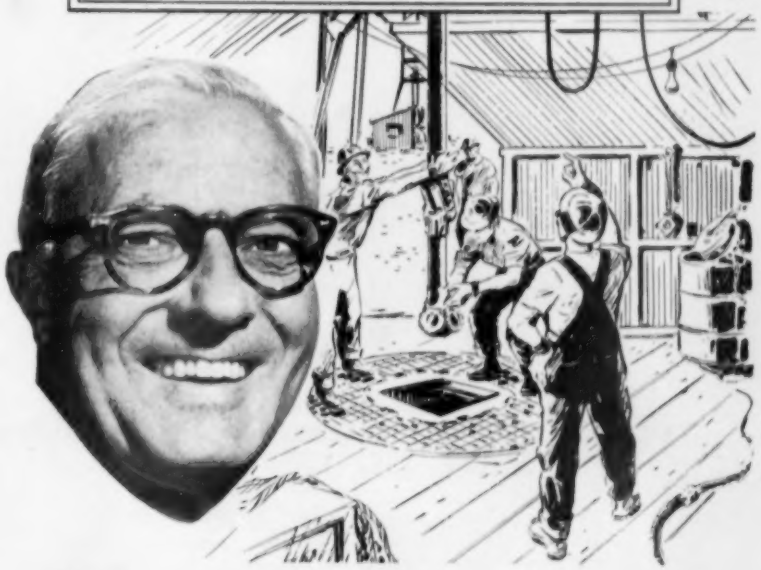
Gas Act Needs Amending

". . . The outstanding contribution of conservation has been that is has provided the basis for insuring the nation

an adequate and continuous supply of petroleum for all peacetime needs and essential requirements during war emergencies . . . Conservation has brought abundance rather than scarcity in oil supplies . . . It has been amply demonstrated that with conservation the industry has performed more than creditably.

"I want to stress that these benefits of conservation have been obtained without federal control . . . I fear, however, that the struggle against federal control is far from ended . . . I urge the Compact Commission to take the lead in preserving the existing system of state conservation of oil and gas.

● They always talk MY language—the petroleum specialists in The Fort Worth National Bank's Oil Loan Division. And when oil loan matters arise, I've found The Fort Worth National gives service that's tops in every respect. That's why I and so many others in the oil industry are saying . . .



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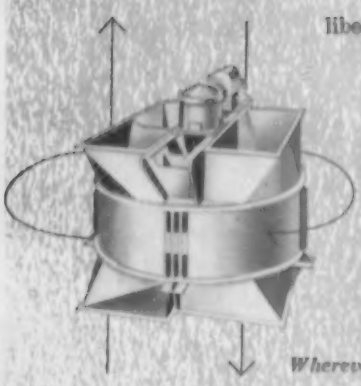

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"The Natural Gas Act as construed by the Supreme Court in the recently decided Phillips case brings federal authority into direct conflict with state oil and gas conservation programs, and unless the act is amended by Congress, these programs will remain in jeopardy. . . ."

J. C. Donnell, II, president of Ohio Oil Co., at the Omaha meeting of the Interstate Oil Compact Commission.

CALENDAR

OCTOBER

5-6 Texas Mid-Continent Oil & Gas Association, annual meeting, Plaza Hotel, San Antonio.

5-7 American Institute of Electrical Engineers, Middle Eastern district, Abraham Lincoln Hotel, Reading, Pa.

6-8 Eighteenth Technical Conference on Petroleum Production, Pennsylvania State University, State College, Pa.

7-8 California Natural Gasoline Association, twenty-ninth annual fall meeting, Ambassador Hotel, Los Angeles.

7-8 American Institute of Mining and Metallurgical Engineers, Pacific Petroleum chapter, fall meeting, Biltmore Hotel, Los Angeles.

8-9 Gas Measurement Institute, Legion Hall, Liberal, Kans.

10-13 American Association of Oilwell Drilling Contractors, fourteenth annual meeting, Biltmore Hotel, Los Angeles.

10-16 Oil Progress Week.

11-13 American Gas Association, annual convention, Atlantic City, N. J.

12-15 American Chemical Society, national meeting, Chicago Coliseum, Chicago.

12-15 Eighth National Chemical Exposition, Chicago Coliseum, Chicago.

12-15 National Association of Corrosion Engineers, technical committees, Dallas.

14-17 Permian Basin Oil Show, Odessa, Tex.

17-20 American Institute of Mining and Metallurgical Engineers, petroleum division, fall meeting, Plaza Hotel, San Antonio.

18-20 Joint Lubrication Conference, American Society of Mechanical Engineers and American Society of Lubrication Engineers, Lord Baltimore Hotel, Baltimore.

21-22 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.

21-23 Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver.

22-24 Golden Trend Oil Exposition, County Fairs Building, Pauls Valley, Okla.

24-26 Independent Petroleum Association of America, annual membership meeting, Mayo Hotel, Tulsa.

25-27 National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco.

26-28 Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.

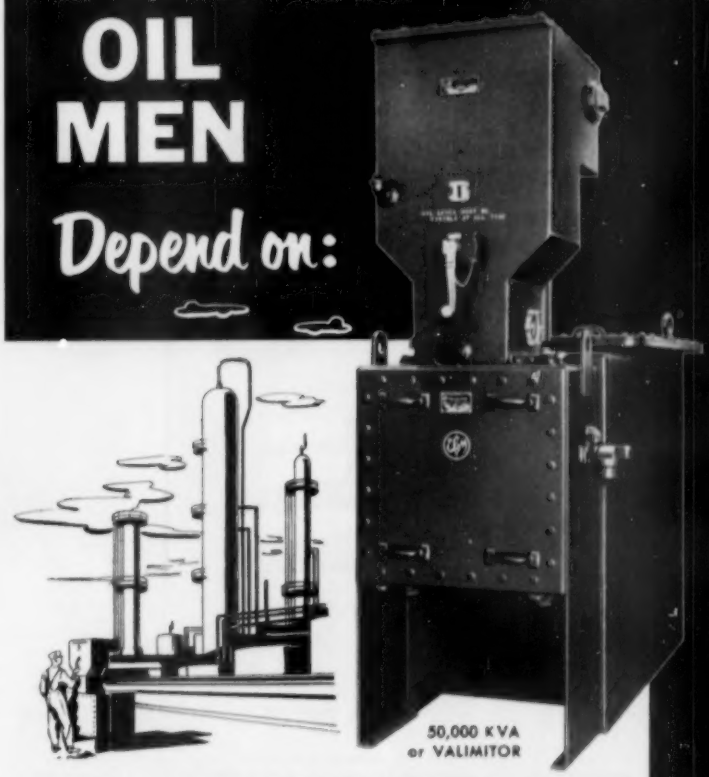
26-29 National Clay Minerals Conference, Rice Institute campus, Houston.

29 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

NOVEMBER

1-3 Geological Society of America, annual meeting, Statler Hotel, Los Angeles.

OIL MEN Depend on:



EC&M 2200-5000 VOLT Motor Starters

These EC&M Division 1 combination Starters for Class I, Group D hazardous locations give petroleum men top-value. They require less floor space . . . line, motor and control leads are brought to conduit connection box for quick installation . . . and interrupting capacity is high . . . either 50,000KVA or in the VALIMITOR (volt-ampere-limitor) type, unlimited short circuit protection.

Oil disconnect switch (on top) may be locked open or closed, and has view windows on both sides to show switch contacts. Overload Relays of THERMAL-MAGNETIC type (mounted in conduit connection box) give accurate motor protection . . . trip instantly on faults.

Rear oil-tank has potential transformer for 220-volt push button circuit. 50,000 KVA type ZHS Magnetic Contactor may be inspected without disconnecting any bolts or leads. Contacts are copper tungsten alloy. VALIMITOR Starters, with air-core current-limiting reactors in rear tank, limit fault current to 25,000 KVA . . . ZHS Contactor clears circuit quickly. No fuses, no need to figure short possibilities . . . supply bus can be infinite KVA.

Before buying, investigate EC&M Combination Starters . . .they provide economy in installation, operation and maintenance . . . and they're complete in every respect.

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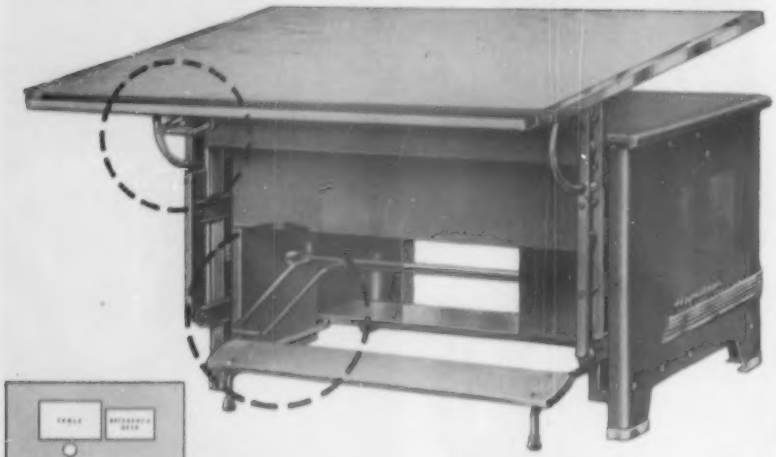

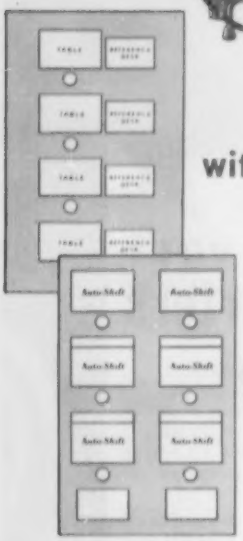

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3-5 Gulf Coast Association of Geological Societies, fourth annual meeting, Rice Hotel, Houston.

4 American Association of Oilwell Drilling Contractors, third annual South Louisiana safety clinic, New Iberia, La.

4-5 Society of Automotive Engineers, national fuels and lubricants meeting Mayo Hotel, Tulsa.

4-6 Air Pollution Control Association conference, Biltmore Hotel, Los Angeles.

5 Southern Gas Association, conference on field production of natural gas Herring Hotel, Amarillo.

8-11 American Petroleum Institute, thirty fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

11-12 American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.

17-18 North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.

18-19 National Association of Corrosion Engineers, fourth annual conference of western region, Hotel Biltmore, Los Angeles.

18-19 Society of Exploration Geophysicists, eighth annual midwestern meeting, Adolphus Hotel, Dallas.

28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York

DECEMBER

2-4 Interstate Oil Compact Commission winter meeting, Drake Hotel, Chicago

2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.

3 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

12-15 American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

1955

JANUARY

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.

26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

FEBRUARY

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

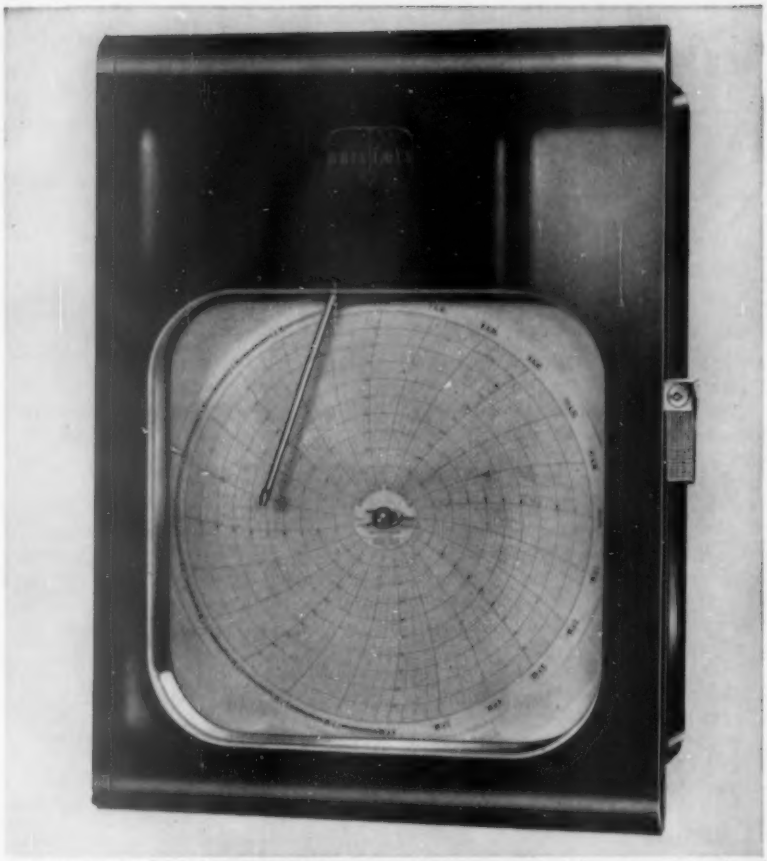
4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

24-25 American Gas Association, gas supply, transmission, and storage conference, Wm. Penn Hotel, Pittsburgh.

JUNE

16-18 Interstate Oil Compact Commission, Denver.



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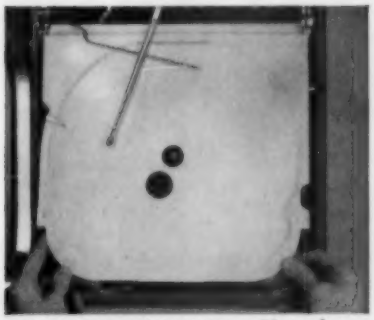

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THE OIL AND GAS
JOURNAL

TULSA, OKLAHOMA

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●

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JOURNALLY Speaking

Too Facetious?

WE were somewhat taken aback by an editorial in a British trade publication explaining why that paper carries no jokes, cartoons, or humorous material.

The function of a trade journal, our British counterpart explained, is to print a combination of news items, trade features, and technical or scientific papers; it must live with its industry, represent its industry, and be considered by its readers as an integral part of its industry. He concluded:

"It can be said, therefore, that the preparation and publishing of a trade paper is all in the day's work of the industry concerned. While it is a good and wise thing to retain one's sense of humour while doing the day's work, do we really want humour interspersed with the labours on which we are so diligently engaged? Very doubtful indeed—humour so easily descends to facetiousness—a quality few can tolerate."

Well, that seems to put this department in its place, though we have no reason to suspect that the sober-sided Briton had us in mind when he wrote that editorial. We will be the first to admit that our own attempts at humor very easily descend to facetiousness. The same indictment doubtless holds against many of the cartoons appearing in the Journal.

It may be true in England that facetiousness is "a quality few can tolerate" but we doubt that the statement holds in the United States, for much of the alleged humor which we run across in this country borders, to say the least, on the facetious. No one has ever been able to analyze the essential elements of a joke, but it is well known that British humour and American humor differ in more ways than the spelling of the word. Maybe Americans are facetious.

At any rate, if readers of this publication can't tolerate facetiousness, or if they really don't want humor (facetious or otherwise) interspersed with the labors on which they are so diligently engaged, they can easily skip the small amount we carry. Except for a few cartoons and an occasional item on this page (we do try to be nonfacetious at times) everything else in the Big Yellow Book is strictly serious and related to the day's work of the oil industry.

Facetious Economics?

WE have to hand it to an eastern filling-station operator who rebelled at the high-pressure sales efforts put on him by his supplier to sell a certain number of gallons of gasoline every month. He advertised a half-price sale and got rid of his entire month's quota in one week end. Then he closed up shop and went fishing. He lost a couple of thousand bucks, but he wrote it off as advertising and said it was worth it to get the company off his neck and have a little leisure.

Of course he didn't increase total gasoline consumption in his area, but do the other price-cutting and competitive-selling devices used by bigger marketers? And maybe the slug of dough he lost all at once does not compare unfavorably with the total amounts frittered away in driblets over longer periods by other distributors whose goal is gallonage rather than profits. Besides, by doing it all at once, this guy got his headaches over with at one fell swoop and had some time to forget it and enjoy life.

Perhaps it's facetious economics, but maybe that fellow wasn't so crazy after all.

Notes From All Over

WALTER B. JONES, Oil and Gas Supervisor of Alabama, told his fellow delegates to the Interstate Oil Compact Commission that they may think they know something about drouth, but down in Alabama water has been so scarce this summer that they've been sprinkling the Baptists and dusting off the Presbyterians.

—Henry D. Ralph.

They drill out faster because they are *skillfully designed to break up readily* under the drilling bit. • Consideration was given to "drillability" in the design of every part. • Furthermore, they are . . .

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BAKER BRIDGE PLUG

Must we choose between imports and bureaucracy?

THE furor over the Buy American Act as applied to government purchases of petroleum products illustrates the difficulty of trying to apply a rigid legislative formula to anything as delicate as the petroleum supply-demand balance in the United States.

Last spring the General Services Administration exempted petroleum products from the Buy American Act, and in justification issued a statement to the effect that domestic crude oil cannot be produced in sufficient quantities to meet current demands and so the Government must use foreign supplies.

THAT, OF COURSE, WAS MISLEADING, erroneous, and silly. Domestic producers were justified in raising the roof about it. After months of red-faced silence and study, GSA has now announced a policy which more nearly meets the situation.

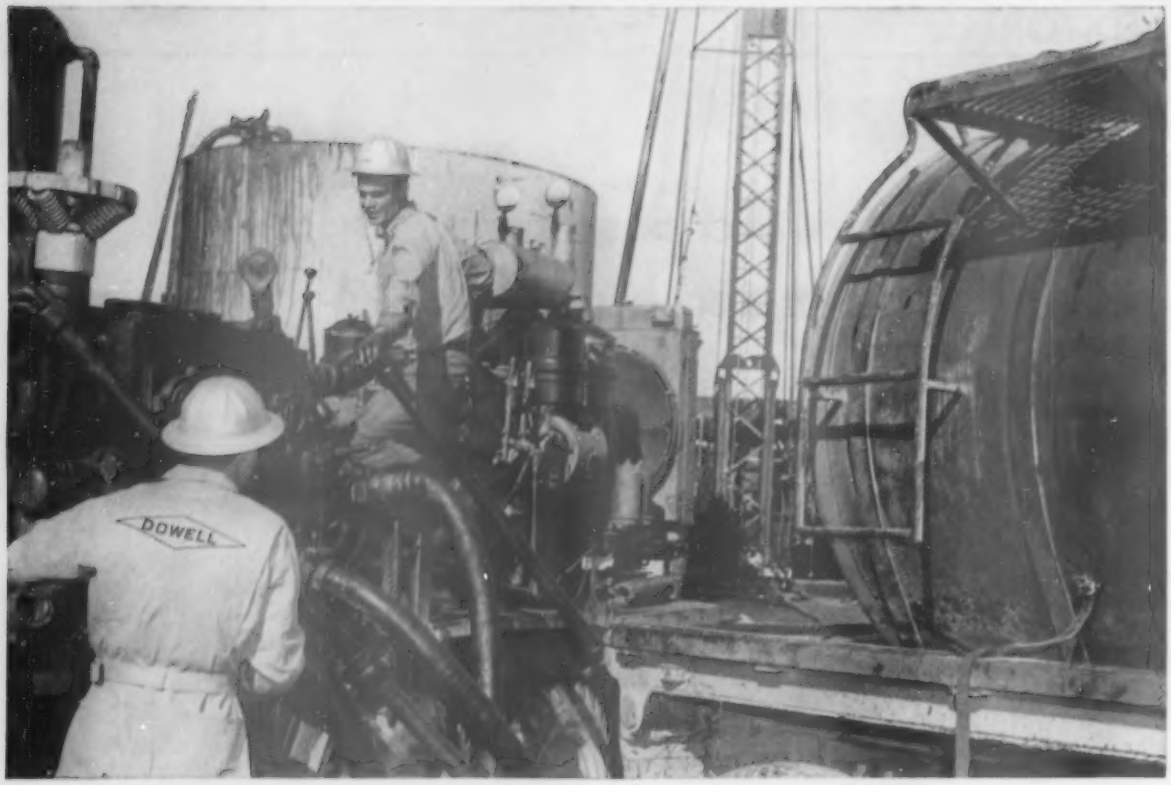
Because the products of foreign and domestic crudes are generally commingled at refineries, marketers in many areas were unable to certify that their products were 100 per cent American in origin. Under the new policy, the Buy American exemption applies only on the East Coast, and in other areas the Government will give preference to bidders who state that their products are made substantially from domestic crude.

That is probably a realistic and workable solution. At least it rescinds the arbitrary, sweeping dictum that implied that there is a shortage of oil everywhere in this country. But the entire incident is a warning against bureaucratic interference with the workings of supply and demand.

THERE IS MORE CRUDE OIL AVAILABLE in this country than the market can absorb at present. The entire industry agrees on that. And a big majority of the industry is convinced that the continuing high level of imports is the reason.

But there is very little agreement on what to do about it. Dozens of schemes for government regulation of imports have been proposed but abandoned for just the reason exemplified in that GSA comedy of errors. No administrative machinery has yet been devised that will be sufficiently flexible and sensitive to keep supply in nice balance with demand and be free from arbitrary action, involved red tape, and the other characteristics of bureaucracy.

The best way to keep imports adjusted to market needs is through voluntary, independent action by a half-dozen big importers. But if this continues to be ineffective, irate domestic producers may conclude that the evils of government regulation are preferable to the evils of a glutted market and will press Congress for action.



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THIS WEEK... ...IN THE NEWS

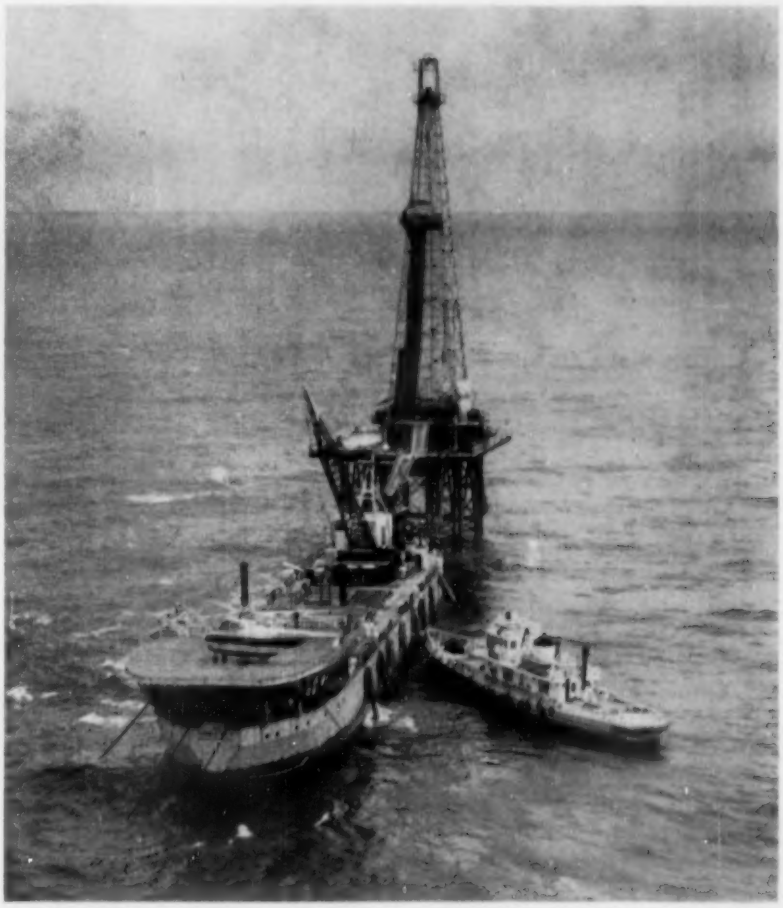
OFFSHORE—The federal Government and Louisiana reach temporary agreement on control of outer Continental Shelf off Louisiana as the big day for leasing the land — October 13 — approaches. . . . Louisiana agrees to cancel scheduled sale of disputed tracts while the Government withdraws 19 tracts covering 45,000 acres. . . . Soaring bonuses expected, but lack of equipment will stymie an immediate big play. . . . ¶Gulf Oil Corp. temporarily abandons its wildcat on $3 million Block L-774 off Mustang Island after drilling to 12,500 ft. . . . Well flowed salt water on final tests. . . . ¶Magnolia spuds wildcat projected to 13,000 ft. in $2 million block about 14 miles southwest of Sabine Pass in Texas tidelands. . . . ¶Interior Department pays California $49 million in royalties for oil and gas leases in the 3-mile area off California's shore. . . . Payment ends dispute over who owns the land.

NATURAL GAS—Firm requirements for natural gas will increase almost 32 per cent between now and 1957, the American Gas Association predicts. . . . Demands will require additional major trunk lines in Appalachian and Great Lakes regions, A.G.A. says. . . . ¶Westcoast Transmission Co. asks U. S. Court of Appeals at Philadelphia to review FPC approval of Pacific Northwest Pipeline's gas pipeline to Pacific Northwest from San Juan basin. . . . Westcoast was unsuccessful applicant to serve same area with Canadian gas. . . .

EXPLORATION—Amerada Petroleum Corp. has new discovery in Stark County, North Dakota, making it the state's seventh county with oil production. . . . ¶New Ellenburger-producing structure is indicated in Crockett County, West Texas. . . . ¶Cities Service Oil Co. and Forest Oil Corp. make important discovery on Dora Roberts Ranch, Midland, County, Texas. . . . Located midway between two producing fields, the well flowed at the rate of 37 bbl. of oil per hour. . . .

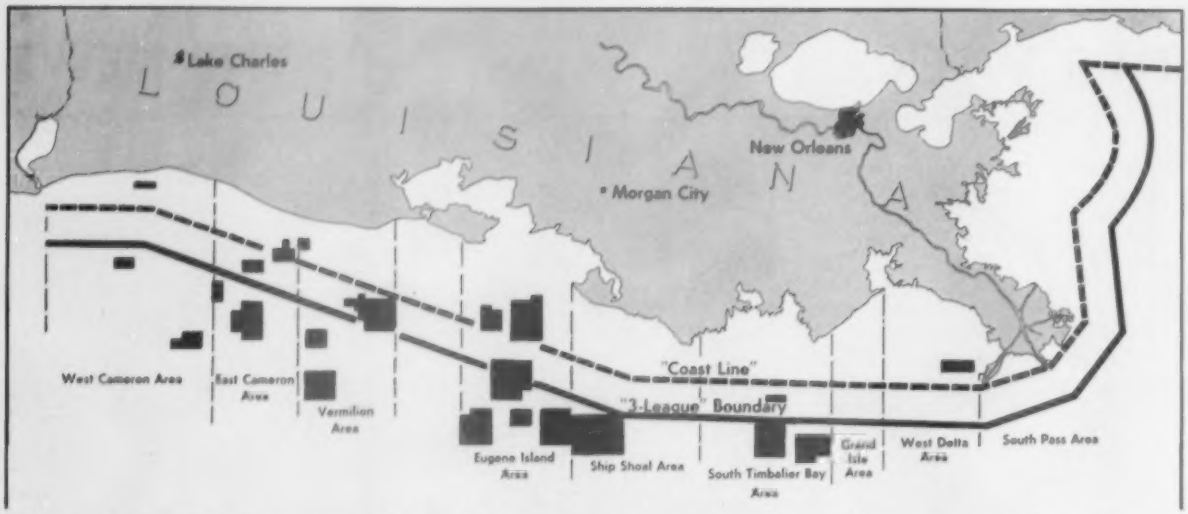
PRODUCTION—Increases in free world foreign production during July fail to balance cutbacks in United States' output. . . . World production drops 149,000 bbl. daily to lowest point since last January. . . . ¶Humble Oil & Refining asks Texas Railroad Commission for 1-year permit to conduct experimental five-spot water flood in Spraberry formation. . . . Humble believes conventional water flood will coax production from tight sand which so far has resisted conventional methods. . . .

REFINING—Indiana Standard dedicates 30,000-bbl. refinery at Mandan, N. D. . . . Nation's newest processing plant is expected to double production in North Dakota by providing the first big outlet for Williston basin crude. . . . ¶Gulf Oil Corp. sets November 21 as date it will shut down its 4,440-bbl., 25-year-old Sweetwater, Tex., refinery. . . . Obsolescence given as reason for closing. . . . ¶First data on performance of Calstate's Hyperformer given by Union's Clyde Berg. . . . Calstate unit, with a capacity of 1,100 bbl. daily, is first commercial installation of new type of cat reformer. . . .



MAJOR COMPANIES are taking a close look at the outer Continental Shelf off Louisiana as the federal Government's lease sale approaches. The leasing will include 180 tracts covering 703,000 acres and will be the first federal leasing since passage of the Submerged Lands Act last year. Turn the page for a comprehensive review of what may result from the October 13 leasing.

INTERNATIONAL — Two important Australian wildcats fail. . . . One, a northeast offset to Rough Range discovery, was dry in discovery formation. . . . Earlier southwest step-out also was dry. . . . Second well, testing the big Cape Range structure, found salt water in the corresponding formation but is to drill deeper. . . . Results expected to take edge off oil fever in western Australia. . . . ¶Standard-Vacuum acquires two concessions in Pakistan. . . . ¶McBride Oil & Gas forms company to conduct exploratory program in British Guiana. . . .



BLOCKED AREAS include the 199 tracts originally offered for leasing off Louisiana by the federal Government. Nineteen have been withdrawn until the boundary question is settled.

What Louisiana Leasing Means

- **Federal Government to open 703,000 acres to exploration October 13; state sale of portion of land postponed**
- **Record prices are almost certain, but lack of equipment expected to delay any big upsurge in drilling**

ALTHOUGH the legal fog is still thick off the coast of Louisiana, the federal Government will award oil and gas leases on 703,000 acres of the outer Continental Shelf October 13.

The Interior Department and Louisiana's Minerals Board reached an agreement late last week which cancelled Louisiana's plans to open bids on about 40 per cent of the same land. The agreement postponed the state leasing indefinitely and cut the amount of land to be leased by the federal Government from 758,000 to 703,000 acres. All the federal land up for leasing is 3 leagues or 10½ miles from shore.

The leasing will be a big day in the petroleum industry and will answer these questions:

... **How big a price tag** do the major oil companies place on the Louisiana tidelands?

... **Will the companies** be eager to tackle offshore operations that mean drilling in water much deeper than most current operations?

Vital issues that will go unanswered include:

... **How much oil** lies beneath the outer shelf?

... **Who really controls** the disputed tracts, Louisiana or the Government?

Regardless of the outcome of the leasing, no mass exploration assault on the outer shelf is expected. The Gulf is expected to be the scene of much of the oil play in the future, but a lack of equipment will not permit speedy development.

What may happen . . . There is little doubt that some record prices will be paid for the leases and that the bidding will be dominated by the major companies. None of the companies will even hint what it will pay for the leases, but all show keen interest.

The bidding will be a case of swinging in the dark for big stakes. The tidelands are considered rich with oil, but finding and producing it runs into millions. The big companies know this, and most consider they must land shelf leases to establish extensive new reserves. The prospect of costs that may be five times normal production costs isn't expected to hold down the bidding. As much as $3 million for a 5,700-acre block has been paid previously and the initial well in the block has been temporarily abandoned.

At the same time, some Gulf Coast operators claim some of the tracts in deep water won't even attract bids. They say too many problems and too much doubt surround these tracts.

The minimum bid for the 180 federal tracts is $15 an acre. The Interior Department has estimated the Government should earn about $50 million from the leasing. The size of the tracts range from 1,250 to 5,000 acres.

Legal tangle . . . The seven-man committee that met for 2 days last week in Washington is attempting to determine Louisiana's offshore boundary. Both state and federal officials are anxious to clarify the jurisdictional dispute without delaying offshort development—but spokesmen for both sides emphasize that the agreement does not mean that either side is backing down on its claims.

Federal authorities say the Government has jurisdiction over any land 3 miles from the Louisiana shore, but the state claims jurisdiction over a portion of this land. At some points, the state claims control out to 35 miles from the shore *(The Oil and Gas Journal, August 2, page 54)*. The state has established a new "coast line" and claims the historical boundary of the state is 10½ miles from the new "coast line" *(see map.)*

The 19 tracts withdrawn from the federal leasing may be returned for the October 13 sale if the seven-man committee reaches an agreement on the boundary, but such an agreement is unlikely. Both sides have indicated only a court test will determine who controls the land.

Other agreements worked out by the committee were:

... **Proceeds from leases** awarded by

the Interior Department in the future will be held by the federal Government until the Supreme Court decides which government owns the land. This agreement will be nullified if a boundary agreement is reached without a court test.

. . . **The Interior Department** will continue to validate state leases in the disputed area as federal leases under section 6 of the Outer Continental Shelf Act.

. . . **Any permanent coast line** agreement without court action must be approved by the Louisiana Legislature.

Tracts withdrawn . . . The tracts withdrawn from the October 13 leasing are 1 and 2 (West Cameron), 12 through 16 (East Cameron), 35 and 36 (Vermilion), 65 and 70 (Eugene Island), and 192 through 199 (West Delta). All these tracts are between the 3-mile and 3-league "twilight zone."

Committee members . . . Serving on the committee for the Interior Department are James D. Parriott, associate solicitor; Harold J. Duncan, chief of the conservation division; and George Paulus, solicitor of the Geological Survey. Representing the Louisiana Minerals Board are John W. Olvey, chairman; Wesley Clanton, vice chairman; F. Lamar Bryant, member; and Joseph V. DiRosa, assistant attorney general for the state.

Equipment status . . . A shortage of offshore equipment is the principal reason why mass drilling in the Gulf is not expected.

The biggest shortage is in drilling tenders—and the prospects of obtaining new tenders is expensive and time-consuming. All available surplus L.S.T.'s have been converted for offshore drilling and are either in use or committed for future use. For the company needing a tender, this leaves no choice other than to build one.

If the companies elect to operate solely from a drilling platform, the tender shortage poses no problem. But the platform-tender combination has been adopted by most of the firms because of the high cost of building self-contained platforms.

However, most operators agreed the self-contained platforms will be standard procedure for operations 35 to 50 miles from the shore, and one is under construction for such an operation.

It is being constructed in New Orleans for the CATC group composed of Continental Oil Co., Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Oil Co. The platform, which will cost about $1,500,000, will be installed in 97 ft. of water off Grand Isle, La., on federal leases held by the group since 1949.

Texas sale . . . The Government will open bids November 9 on 38 tracts totaling 111,789 acres off the coast of Texas. These tracts lie outside the 3-league limit from Texas and generally are located in deeper water that the majority of the Louisiana leases.

Texas has maintained a 2-mile "buffer zone" between the state-controlled tidelands and the area controlled by the federal Government. No tracts in this zone have been leased by Texas.

What's out there . . . It takes a courageous man to make any kind of estimate about reserves that lie offshore in the unexplored areas. At this stage, they must be in generalities.

Several years ago, Wallace Pratt, regarded as one of the industry's top

Record-Bid Prospect Dry

HOUSTON.—The chips are high when you gamble for oil offshore, and sometimes your luck is bad.

Gulf Oil Corp. confirmed this last week. It is temporarily abandoning its wildcat on Block L-774, 8½ miles off Mustang Island.

The company paid a record $3,068,000 for the 5,760-acre block 9 months ago. It looked good then. Tests last week looked far from good. After drilling in 67 ft. of water to 12,500 ft., Gulf recovered 384 bbl. of salt water on a test.

But, Gulf is expected to gamble again. A six-well platform located at the failure is expected to be moved to another site off the south Texas coast.

Kermac Launches Newest Offshore Barge

The traditional splash of champagne sends Kerr-McGee Oil Industries, Inc.'s, Rig 44 on its way to offshore drilling as Mrs. William F. Baxter, Morgan City, La., wife of Kermac's Louisiana division drilling superintendent, wields the bottle. Dean A. McGee, Kermac president, left, and Sen. Robert S. Kerr, chairman of the board, wince to avoid the spray as Monro B. Lanier and W. R. Guest, president and executive vice president of Ingalls Shipbuilding Corp., Pascagoula, Miss., look on. Kermac, a pioneer in offshore drilling efforts, brought in the first commercial oil well offshore in 1947 near Morgan City.

geologists, predicted 2½ times as much oil would be found under the world's continental shelves as on land. More recently, Ben C. Belt, Gulf Oil Corp. vice president, estimated the reserves off Texas and Louisiana. He believes the offshore potential is about 20 per cent of the present national reserves, or 6 billion barrels plus 15 trillion cubic feet of gas.

In 1953, the National Petroleum Council published a report estimating increased availability within 5 years of 170,000 to 200,000 bbl. daily of crude and natural-gas liquids, and 600 to 800 million cubic feet of gas daily.

Regardless of the estimates, general opinion is that the next 4 or 5 years will be chiefly devoted to determining "What's Out There?" rather than making what is there available. Exploration and drilling will concentrate on determining the resources available, and no major additions to "availability" should be expected before 1960.

Geophysical surveys in the tidelands have revealed a great many favorable oil structures, but stratigraphically, the geologist is shooting in the dark. There isn't enough data available from previous wells to draw conclusions on what might be encountered at most offshore wildcats, especially if the drill site is 15 miles or more from a completed well.

Off the Louisiana coast where sand conditions out to a 10-fathom depth are fairly well known, this problem is not as acute as those of the offshore Texas geologist. For one thing, few tests have gone down off Texas; for another, general opinion favors a less prominent succession of potential reservoir sands along Texas' shores.

The program probably will be confined to an area off Texas and Louisiana covering about 14,000 square miles and in water up to 60 ft. deep. Of the wells drilled, 30 per cent are expected to fail. This is a good success ratio, but offshore wells aren't drilled without the best geophysics, the most competent geology staff available, and the ultimate in favorable indications of success.

Success to date . . . From an investment of more than $350 million the industry has realized a return to date of about $50 million.

There are 118 tideland producers that resulted from 300 tests. Only 24 oil fields have been opened to production —23 off Louisiana and 1 off Texas. Twelve gas fields have been discovered, but only four are producing.

Cumulative production of oil from all fields through June totaled 36,493,172 bbl. On the basis of June's figures, production per calendar day averages 41,000 bbl. This is a big stride over the total offshore production figure of 1947, which was 3,217 bbl. from a single field.

The industry is geared for even bigger gains in offshore operations, but five essentials must be extended operators by the industry, and by state and federal authorities. These are:

. . . Adequate economic incentives—a fair price, good allowables, and continued depletion allowances.

. . . Adequate supplies of manpower and materials.

. . . Confirmation of existing leases.

. . . Additional leases with no strings attached.

. . . Freedom to explore and develop.

INDUSTRY AFFAIRS

Competition makes utilities take . . .

. . . "New Look" at Oil

Robert G. Deering

TULSA.—Competition from Government and R.E.A. power is causing private power companies to take a more liberal view on extending lines to serve small oil-industry loads.

Thomas E. Graham, Oklahoma Gas & Electric Co., said here at a meeting of the Petroleum Industry Electrical Conference of the American Institute of Electrical Engineers, that Government-backed systems, desiring steady loads and being well-heeled with taxpayer money, are extending service to individual wells and other light loads. Practices vary throughout the industry, Graham said, but some power companies are meeting this competition. Others must do so to get new oil-industry business.

In contrast to the old practice of building along section lines only, Graham said that his company will now contact individual wells where economics are favorable, and is usually agreeable to building power lines to serve remote oil field load centers. In most cases, the customer still must build his own low voltage distribution system.

In the long run, this competition and the "new look" by electric power companies will mean more readily available power and better rate contracts for oil operations in remote areas.

Risk money . . . Because regulated profits make it difficult to recoup losses on one venture by doubling up on another, Graham said power companies are loathe to invest in lines to loads which have a doubtful life. Consequently, financial aid is usually asked from the customer in the form of a guarantee on the cost of power line installation and removal. This guarantee is reduced as profits from power service accrue, he said, and is usually redeemed in 2 to 5 years.

In discussions which followed Graham's talk, power utilities were taken to task for expecting the petroleum industry to take all the risk and give the electric utilities a sure shot on profits from new ventures.

Purchased power . . . Graham said that in past instances where oil com-

SOME 300 ENGINEERS from all phases of the industry attended the first meeting of the Petroleum Industry Electrical Conference of the A.I.E.E. in Tulsa last week and heard technical papers on drilling, production, pipelining and refining.

SIMPLE DESIGNS are a prime consideration for unattended automatic pipeline stations, Paul P. Plovanich, Service Pipe Line Co., told the Petroleum Industry Electrical Conference of A.I.E.E. Plovanich's complete text appeared in The Oil and Gas Journal, September 20, page 231.

panies installed their own generating equipment, demand declined some 70 per cent within 10 years due to reservoir depletion, proration, etc., leaving excess capacity with the same amount of fixed charges. This resulted in self-generated power costing more than purchased power, he said.

As a further argument for purchased power, Graham said that natural gas, once used as "free fuel" for oil field generating plants, has such a high market value now that oil companies must weigh carefully the economies of installing their own plants.

Current Cheaper Than Gas

TULSA.—A direct comparison of costs on similar water-flood projects shows that operation with electrical equipment is about one-half as expensive as operating with gas engines, Frank Beach, Cities Service Oil Co., said here before the Petroleum Industry Electrical Conference of A.I.E.E.

For his comparison, Beach used figures from the electrified water-flood project of Madison field and the gas-engine-operated project of Patterson block, both in Kansas.

With gas at 24.5 cents per M.c.f., Beach said that electrical power costs per barrel of fluid pumped would amount to about half the cost of fuel for gas engines. A comparison of maintenance costs between the two systems is heavily in favor of the electrical method, he said, but added that the comparisons are indicative only and are not conclusive, since they apply to only one specific case.

He attributed a reduction in personnel in the Madison district, despite the heavy increase in production, to the low maintenance requirements of the electrical equipment.

Beach said that his company's experiences with the Patterson block and earlier water-flood projects using gas engines were unsatisfactory and that all subsequent projects were completely electrified.

Union Move Awaited

Sinclair talks stymied; early merger is expected

DENVER.—Oil Workers International Union, deadlocked in negotiations with Sinclair Oil Corp., is planning new strategy in its battle for a 5 per cent wage increase.

An O.W.I.U. strategy board which was to decide the union's next step, has turned the problem over to its nation-wide negotiating committee. B. J. Schafer, O.W.I.U. vice president and coordinator for the negotiating committee, declined to reveal plans being considered by that committee.

Negotiations with Sinclair, which bogged down several weeks ago, are considered highly important because that is the only company which bargains on a national scale with O.W.I.U. The outcome may set the pattern for future negotiations on the local level.

O. A. Knight, union president, hinted recently that O.W.I.U. might withdraw its no-strike pledge if necessary to obtain the desired 5 per cent wage hike *(The Oil and Gas Journal, September 27, page 51).*

Continued stalemate in negotiations with Sinclair leads to speculation that the O.W.I.U. policy committee may be summoned to a special session in the future to reconsider its no-strike pledge.

Significance of a strike threat might be increased considerably if O.W.I.U. succeeds in combining its strength with that of independent oil unions and organized workers in allied industries.

Merger of O.W.I.U. with the United Gas, Coke and Chemical Workers Union is expected to become a reality immediately after the oil workers vote on the proposal at their annual convention opening in Cleveland November 15.

Anticipating quick approval of the merger by O.W.I.U., the Gas, Coke and Chemical Workers have scheduled a special meeting in Cleveland November 17 so the two unions can go into immediate joint session and finalize the amalgamation. The merger already has been ratified by the chemical workers organization.

Conoco Plans New Financing

HOUSTON. — Continental Oil Co. has revealed plans to issue debentures totaling $100,000,000 to retire short-term loans and finance further development of oil and gas properties.

L. F. McCollum, Conoco president, said a registration statement covering the issue soon will be filed with the Securities and Exchange Commission.

The transaction would be one of the largest undertaken by an oil company in recent years.

Price Announces Contract

BARTLESVILLE, Okla. — H. C. Price Co. will build 68 miles of 26-in. natural-gas pipeline loops for Tennessee Gas Transmission Co. in Ohio.

Right-of-way work has started, and the Price company expects to begin laying pipe by October 11. Price will put three spreads in the field at Oak Hill, Newcomerstown, and Columbiana, Ohio.

Price recently completed three 26-in. loops in Ohio for Tennessee.

Key Dora Roberts Test Hits

MIDLAND.—Cities Service Oil Co. and Forest Oil Corp. 1 Dora Roberts "B-1," key well in the rapidly developing Ellenburger trend in southwest Midland County, West Texas, flowed oil on its first test in the Ellenburger.

The test was run from 12,890-12,958 ft., using 2,000 ft. of water blanket. Oil reached the surface in 2 hours, was turned into pits for 8 minutes, then turned into tanks where it gaged 37 bbl. of 52° oil in 1 hour. Gas-oil ratio was 1,250 cu. ft. Top and bottom chokes were ¾ and 1-in. There was no water.

Location of the well is 3 miles south of Ellenburger production in Headlee field, and the same distance northwest of the nearest producers in the Dora Roberts Ranch trend. No. B-1 Roberts may be the main factor to prove these pools as one structure with an approximate 17-mile northwest-southeast structure, or a series of producing highs.

U.S. Gas requirements and supply—Natural-gas companies

(Millions of therms)

Requirements—	1953	1954	1955	1956	1957
Residential:					
General	5,913.7	6,302.9	6,683.3	7,015.9	7,591.8
Space heating	10,195.0	11,939.3	13,077.4	14,328.7	15,801.9
Total residential	16,108.7	18,242.2	19,760.7	21,344.6	23,393.7
Commercial	4,499.0	5,008.5	5,315.7	5,634.2	6,072.0
Industrial and other	19,967.0	21,817.0	23,199.9	24,813.9	25,849.5
Total firm requirements (utility consumers)	40,574.7	45,067.7	48,276.3	51,792.7	55,315.2
Company use	3,611.3	4,281.9	4,485.8	4,635.3	4,778.4
Underground storage:					
Injection	4,097.9	4,323.5	5,014.7	5,513.2	5,740.2
Withdrawals	2,377.7	3,602.1	3,786.6	4,279.2	4,921.9
Net	1,720.2	721.4	1,228.1	1,234.0	818.3
Unaccounted for	2,418.1	2,443.1	2,572.2	2,645.7	2,769.5
Total firm requirements	48,324.3	52,514.1	56,562.4	60,307.7	63,681.4
Supply available from existing and planned facilities—					
Natural gas:					
Produced within region	34,035.0	36,217.7	37,358.5	38,500.1	39,488.8
Transported from other regions	30,116.3	33,231.8	36,030.5	37,939.0	39,189.3
Total natural-gas supply	64,151.3	69,449.5	73,389.0	76,439.1	78,678.1
Manufactured gas	64.0	44.4	44.1	60.4	73.7
Liquefied petroleum gas	8.2	18.0	19.8	23.5	24.6
Total gas supply	64,223.5	69,511.9	73,452.9	76,523.0	78,776.4
Excess supply over firm requirements	15,899.2	16,997.8	16,890.5	16,215.3	15,095.0
Interruptible sales and company use	14,733.3	16,018.0	16,595.3	16,584.0	16,295.4

Big Growth Seen in Gas Demand

FIRM requirements for natural gas will increase 31.8 per cent during the 1954-57 period, the American Gas Association predicted last week.

Growing demands will require additional major trunk lines in two particular areas, the Great Lakes and the Appalachian regions, the forecast indicates.

The A.G.A. said firm requirements for gas in 1957 will total 63.7 billion therms—about 6.2 trillion cubic feet compared with 48.3 billion therms, or about 4.7 trillion cubic feet, in 1953.

This estimate includes gas used for residential, commercial, and industrial purposes, plus the net amount added to underground storage. It does not include interruptible sales, which are not considered "firm" requirements.

Growth areas . . . Biggest increase in natural-gas demand, the A.G.A. said, will be in the Appalachian region, including all states south of New England to the Virginia-North Carolina border and west to include West Virginia, Kentucky, and Ohio.

In this area, firm requirements are expected to increase 23.7 per cent over 1953 sales to a total of 15.27 billion therms. Total supply for this region in 1957 is expected to be 14.29 billion, an increase of only 6.1 per cent.

This would leave the area with a demand greater than supply, even without considering anticipated interruptible sales, which are forecast at 1.0 billion therms in 1957.

A therm is 100,000 B.t.u.'s, the equivalent of about 96.8 cu. ft. of natural gas.

Firm requirements in the Great Lakes area, including Illinois, Indiana, Michigan and Wisconsin, are set at 7.74 billion therms in 1957, a tremendous gain of 81.7 per cent over 1953. Total supply in 1957 is expected to increase to 9.06 billion therms, up 39.5 per cent from 1953. Interruptible sales of 1.99 billion therms would put total

Material Requirements, Gas Utility and Pipeline

(Thousands of tons)

	Actual	Estimated				
	1953	1954	1955	1956	1957	Total 1954-1957
Steel pipe:						
16 in. and larger	1,508	933	896	427	622	2,878
6⅝ in. but less than 16 in.	359	339	246	224	207	1,016
Less than 6⅝ in.	201	214	183	177	174	748
Total steel pipe	2,068	1,486	1,325	828	1,003	4,642
Other steel	51	43	43	24	24	134
Total steel	2,119	1,529	1,368	852	1,027	4,776
Other material:						
Cast iron	127	113	116	106	111	446
Copper	2.778	2.301	2.352	1.982	1.954	8.589
Aluminum	0.241	0.170	0.125	0.093	0.114	0.502

demand above the available supply, indicating the need for new supply in this area.

In the Upper Mississippi Valley, including Iowa, Minnesota, eastern Nebraska, and South Dakota, current pipeline expansion is expected to provide enough gas to meet demands over the next few years.

Firm requirements in 1957 are set at 2.43 billion therms, compared with 1.67 in 1953, or a gain of 45.3 per cent. Supply, however, is expected to be 4.25 billion therms, which is greater than the firm demand plus anticipated interruptible sales.

In other phases of its annual forecast the A.G.A. predicted that:

. . . **Steel-pipe** requirements during the 1954-57 period will be 4.6 million tons. Of this total, 2.9 million tons will be 16-in. and larger and will go primarily into construction of gas-transmission lines.

. . . **Underground-storage** expenditures will total $114,000,000 during the 4-year period. Peak-day withdrawals of 100 million therms are expected in 1957. This would be one-fourth of the total available gas supply from all sources.

. . . **Space-heating** requirements in 1957 will be up 53 per cent over those of 1953 and will represent nearly one-fourth of total demand of all customers.

. . . **Industrial sales** on a firm basis will account for 45 per cent of total industry sales in 1957. They will account, however, for only 24 per cent of the peak-day requirements during the 1957-58 heating season.

. . . **Interruptible sales** of gas will show only a slight increase during the 4-year period, explained by the increasing use of underground storage for meeting peak-day demands imposed by home-heating requirements.

Westcoast Asks For Review

PHILADELPHIA. — Westcoast Transmission Co., Inc., has carried its fight to the U. S. Court of Appeals here to prevent Pacific Northwest Pipeline Corp. of Houston from building a natural-gas pipeline to serve the Pacific Northwest.

The company has asked the court to review a Federal Power Commission decision of last June giving the rival Pacific firm permission to build a 160-million-dollar system using gas from the San Juan basin in New Mexico, Arizona, and Colorado. Westcoast had planned to serve the same area with natural gas imported from Alberta in Canada.

The FPC recently turned down Westcoast's application for a rehearing.

Recipients Named

Conservation boosters win Texas association awards

DALLAS. — The 1954 distinguished service awards of the Texas Mid-Continent Oil and Gas Association will go to two oil men who long have championed the cause of petroleum conservation.

Recipients will be E. A. Landreth, Fort Worth independent oil operator, and Edgar F. Bullard, president of Stanolind Oil & Gas Co., Tulsa. The awards will be presented October 6 at the association's thirty-fifth annual meeting in San Antonio.

E. A. LANDRETH

E. F. BULLARD

The association presents awards annually to an independent producer and a big-company executive for outstanding service to the industry.

Landreth, a Missourian, began his oil career at Breckenridge, Tex., in 1918 and erected one of the first casing-head gasoline plants in Texas. He drilled more than 60 wells in Rock Crossing pool, Wilbarger County, North Texas, in 1926. He later drilled seven successive dusters in West Texas before hitting oil in Church-Fields pool, Crane County.

After bringing in 16 wells there, he went on to develop more production in important West Texas-New Mexico fields, including North Cowden and Goldsmith pools.

Landreth was one of the most energetic supporters of Texas oil and gas conservation laws during the early 1930's and helped raise funds to enforce conservation practices. He is a trustee of Texas Christian University and reportedly has raised more than $5,000,000 for that institution.

Bullard . . . Regarded as one of the most energetic oil executives in the country, Bullard not only supervises the big Stanolind empire but he serves as president and director of 15 other oil and gas enterprises scattered from Texas to Canada.

He has been a strong advocate of conservation and quick to adopt new oil-hunting techniques. He was one of the first to accept geophysics wholeheartedly.

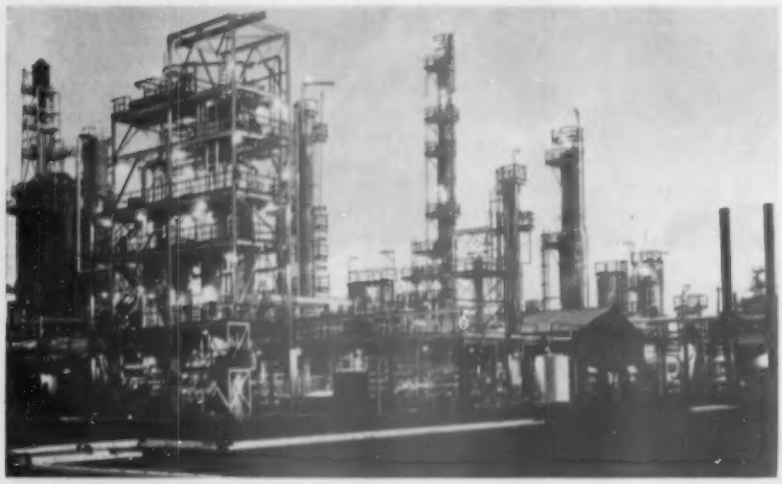
Bullard was graduated from Yale University in 1921 with a degree in geology and joined Dixie Oil Co. He became director of exploration for Stanolind in 1931, vice president in 1932, executive vice president in 1935, and president in 1945.

He was a delegate to the World Petroleum Congress at The Hague in 1951.

Secretary Mitchell Tours Torrance Refinery

Secretary of Labor James Mitchell (second from left) shakes hands with K. R. Basham during a recent visit at the Torrance, Calif., refinery of General Petroleum Corp. Introducing the secretary is Richard Baurmann, chairman of the workmen's committee of the Oil Workers International Union local, while B. W. Williams and W. K. Carder look on.

NATION'S NEWEST refinery is this Indiana Standard plant on the Missouri River at Mandan, N. D.



PROCESSING CENTER is this compact processing unit, which converts crude oil into finished products without intermediate storage.

TALLEST STRUCTURE is the 172-ft. fluid cat cracker.

Refinery Dedicated

Indiana Standard puts 30,000-bbl. Mandan refinery on stream, formally dedicates crude and product pipelines

MANDAN, N. D.—North Dakota's first major refinery—the 30,000-bbl. plant of Standard Oil Co. (Ind.)—has gone on stream.

The new refinery was dedicated here October 2 in the climax of a 4-day local celebration.

The new refinery is significant because it will provide the first big market for Williston basin crude oil. North Dakota production, first discovered by Amerada Petroleum Corp. in April 1951, has been held far below capacity by lack of an adequate outlet. At present there are nearly 450 producing wells with an aggregate production between 14,000 and 15,000 bbl. per day. Completion of the new refinery is expected to more than double production.

Crude reaches the refinery through a 156-mile, 12 and 16-in. line operated by Service Pipe Line Co., an Indiana Standard subsidiary. Products not marketed locally will move through Indiana Standard's new products line connecting with the company's products system at Moorhead, Minn.

A feature of the new Mandan refinery is its combination processing unit which incorporates distillation, catalytic cracking, vapor recovery and polymerization. Characteristics of the North Dakota crude are such that all reduced crude can be charged directly to the Model IV fluid cat cracker.

Other processing facilities include a conventional 25,000-bbl. Linde copper-chloride sweetening plant, a 12,500-bbl. doctor plant, caustic wash plants for light and heavy cycle oils, and depropanizing and debutanizing units.

The refinery contains 53 tanks with a total capacity of 2,770,000 bbl., including crude storage of 616,000 bbl., gasoline-component storage of 554,000 bbl., crude gasoline storage of 384,000 bbl., and finished gasoline storage of 409,000 bbl.

ROCKY MOUNTAIN

Hearing Postponed

Northern Natural revises proposal for gas pipeline

BISMARCK, N. D.—The Public Service Commission has granted Northern Natural Gas Co.'s request to delay a hearing scheduled for October 5 on the Omaha firm's application for a certificate to build a North Dakota natural-gas pipeline.

Commissioner Ernest D. Nelson said a date for the twice-delayed hearing will not be set until Northern Natural informs the commission its case is complete. Earlier, the commission delayed a scheduled August 2 hearing on the proposed 24-in. line from Tioga to Fargo.

Nelson said one of the principal reasons cited by Northern Natural in requesting the delay was that negotiations with Amerada Petroleum Corp. for purchase of North Dakota natural gas still are pending.

Amerada, which owns the bulk of casinghead gas produced in the Tioga area, is committed by contract to North Dakota Natural Gas Transmission Co., St. Paul, which proposes to build a line from Tioga to Fargo and Grand Forks, N. D. A hearing on this application has been set for November 16.

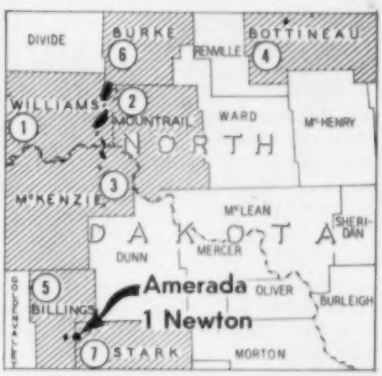
North Dakota Natural's application was dismissed earlier in the year because of failure to meet conditions imposed by the commission, but the company won a rehearing.

Plans changed . . . Northern Natural, in its application filed June 22, told the commission it proposed to build a 24-in. line from Tioga to Fargo as part of its proposed line to bring Alberta gas to Minneapolis-St. Paul. However, a company spokesman said these plans are being changed as result of a contract with Trans-Canada Pipelines, Ltd.

The contract, according to the spokesman, would require Northern Natural to take delivery of 100,000,000 cu. ft. of gas daily at a point south of Winnipeg. It also provides an option whereby Northern Natural could take 50,000,000 cu. ft. daily at a point north of Tioga by 1956 or 1957, he said.

The Northern Natural official said the company now hopes to build a 24-in. line to tie in with Trans-Canada's spur at the U. S. border south of Winnipeg to serve Grand Forks, N. D., and East Grand Forks and Moorhead, Minn., as well as Fargo, Minneapolis, and St. Paul.

If North Dakota gas can be obtained, he said, the company would tie into Trans-Canada's line north of Tioga and build a 24-in. line from Tioga to a point south of Fargo where it would link with the Winnipeg-Fargo line and a 30-in. line southeastward to Minneapolis-St. Paul.



Oil Area Spreads

Amerada gives N. Dakota seventh productive county

BISMARCK. — North Dakota has been assured its seventh producing county by Amerada Petroleum Corp. 1 Newton in Stark County.

The indicated success, which swabbed 107 bbl. of oil with 24 per cent water in 10½ hours, is about 4 miles east-northeast of Fryburg field. Production is from the Heath sand, making it the second Heath producer in the state. Operator has shut in the discovery.

Stark County becomes the state's seventh producer. Production in North Dakota opened in Williams County. That county now includes the following producing areas: Beaver Lodge, part of Tioga, Northwest Tioga, and Hofflund. Mountrail County production includes White Earth field, and part of Tioga. McKenzie County includes Charlson, Keene, Croff, and West Sanish pools. Bottineau County shallow production includes Northeast Landa, Westhope, and North Westhope pools. Billings County has one pool, Fryburg. Burke County includes the northernmost production at Tioga field.

Wide Spacing Ordered

BISMARCK, N. D.—Beaver Lodge Madison pool has been placed under an 80-acre spacing order for 13 months, beginning October 1.

The Industrial Commission order will put all major deep pools in the state under temporary wide-spacing regulations.

Chief witness before the commission was Henry Keplinger, Tulsa consulting engineer retained by Amerada Petroleum Corp. Keplinger presented a mass of pressure data to show the Madison lime reservoir is continuous and interconnected, with one well capable of draining more than 80 acres.

Although the pool previously was under a 40-acre spacing order, only about 40 of 172 wells in the field have been drilled on that pattern, and all can be incorporated into 80-acre tracts equitably, Keplinger said.

MID-CONTINENT

L.P.G. Pipeline Opposed

KINGMAN, Kans.—Warren Petroleum Corp. has filed an application in District Court here for a review of the Kansas Corporation Commission's approval of a 215-mile, 6-in. natural-gasoline and L.P.G. pipeline proposed by Sunflower Pipeline, Inc.

Warren, which operates tank cars along the route of the line, has opposed the line since it was approved August 11 by the commission. The company and Santa Fe Railway were denied a request for a new hearing.

The $4 million line is proposed from Sublette in western Kansas to Wichita. It will have a daily capacity of 30,000 bbl.

Line to Be Replaced

HOUSTON.—Continental Pipe Line Co. has decided to sell its present 8-in. line from Tonkawa, Okla. to Oklahoma City and to replace it with a 64-mile, 12-in. line.

Cherokee Pipe Line Co., a jointly owned subsidiary of Continental Oil and Cities Service Oil Co., will buy the 8-in. line and convert it to products.

Oklahoma Allowable Up

OKLAHOMA CITY.—The Corporation Commission has set Oklahoma's oil production allowable for October at 495,000 bbl. daily, slightly higher than the September allowable.

An estimated 206,172 bbl. per day will come from allocated pools, with the remainder from unallocated pools. The September allowable averaged an estimated 457,257 bbl. daily. The new allowable is about equal to actual production during September.

FPC Gives An Inch

Commission extends application deadline to December 1; major points in dispute over authority still unanswered

WASHINGTON. — The natural-gas producers' attack on Order 174-A brought one immediate concession from the Federal Power Commission last week but most questions are still unanswered.

Within 24 hours after the 2-day arguments ended, the commission extended the deadline for producers' applications to sell gas from October 1 to December 1.

Between now and then, the commission will consider the many other points raised in the argument. It hopes to announce decisions on the disputed points before the new deadline.

The commission rejected all proposals to revoke its freeze on prices as of June 7. The FPC revised the order to make it clear that provisions for escalation or tax-increase changes in rates in schedules for initial service after June 7 would receive the same treatment as those filed before the freeze date.

The basic question of how producers' initial rates shall be fixed remains among the major points raised against the order. Counsel for producers argued the Natural Gas Act gives the commission no authority to specify what initial rates shall be and limits the commission to action only if it believes the rate to be unjust or unreasonable.

Big point . . . A major point to be decided is the definition of an independent producer subject to FPC regulation under the Phillips decision. It was argued the producer should be defined as one making sales at the tailgate of a processing plant or to a pipeline at the end of a gathering system if the gas is not processed before sale. Producers claim the act clearly limits FPC authority to interstate gas sales rather than to gas that may eventually go into interstate commerce.

Attorneys pointed out that the Columbia Court of Appeals, in the Phillips decision, noted that it would have arrived at a different conclusion if production, gathering, and processing had not already been completed. The Supreme Court, affirming the decision, did not reject the lower court's language and itself noted that all three actions had been finished in the case at point.

Conflict of authority . . . Also to be ironed out is the conflict between federal and state authorities raised by the FPC requirement that permission must be secured before service or facilities can be abandoned. This could force producers to violate state orders to reinject gas into a formation for maintenance of reservoir pressure if that gas is slated for an interstate pipeline.

One of the most important issues is the validity of escalation clauses and provisions to cover tax increases that are found in a large percentage of gas contracts. Producers contend the contract constitutes an initial rate schedule. They point out that pipelines, unable to pay a high price for gas in early stages of operation, are able to pay higher prices as their interest and other fixed charges are reduced. It was argued that the commission should consider this factor rather than decide these automatic increases are changes in rates.

Other points the producers raised included the charge that the FPC did not comply with the requirements of the Administrative Procedures Act when it adopted 174-A without notice or hearing; the Phillips decision did not give the commission authority to do all it has done; and all regulation necessary could be administered under the Natural Gas Act.

The 2-month extension of the deadline was just half the time asked by producers who are finding it difficult to determine which of their contracts fall under FPC jurisdiction.

The commission said its postponement action was taken to prevent hardship in such cases. The FPC has already received 350 applications for certificates to sell gas and 1,500 rate change applications.

Shale Recommendation Due

WASHINGTON.—Industry recommendations on the shale oil policy to be followed by the Government are expected to be submitted to the Interior Department at a meeting of the National Petroleum Council October 19.

Specifically, the council's report will deal with the future operation or disposition of the Government's oil shale plant at Rifle, Colo. It has been recommended that the experimental work at Rifle be discontinued unless there is a substantial contribution by industry under a cooperative agreement.

Results of a number of other NPC

Coal Offers Help—But Not Much

WASHINGTON. — Natural-gas producers battling federal price controls got some help from an unexpected quarter last week—but in a left-handed way.

The bituminous coal industry called for a congressional reversal of the Supreme Court's decision in the Phillips case and amendment of the Natural Gas Act to allow pipeline companies the current market value of gas whether purchased from others or produced by themselves. The effect would be to take out all controls on the price of gas and allow its price to rise to where coal would be more nearly competitive.

At the same time coal men urged rigid controls over the end use of natural gas. They want the Federal Power Commission to be given authority to regulate the end use of gas and block out large markets which they claim the natural gas industry is seizing from coal.

These recommendations were made to the interdepartmental coal committee, which is working under the President's Cabinet Committee on Energy Supplies and Resources Policy.

The coal industry also would like to see:

. . . **Use of coal** instead of gas in all Government establishments.

. . . **Coal used** by all manufacturers and suppliers receiving Government contracts.

. . . **Use of coal** instead of gas by all companies receiving Government financial assistance of rapid tax amortization.

Other recommendations would give the FPC jurisdiction over direct sales of gas to consumers in interstate commerce; amend the Natural Gas Act to provide that natural gas be reserved for "higher purposes;" require that producing states be given first call on remaining gas reserves; require regulation of natural-gas lines as common carriers and forbid them to transport their own gas.

studies are expected to be reported by committees on Government personnel, emergency defense organization, current petroleum productive capacity, use of radio and radar, and petroleum storage capacity.

Oil Defense Needs Studied

WASHINGTON.—Steps to be taken by the petroleum industry to prepare for possible enemy attack are under study by two groups set up last week by Dr. Robert E. Wilson, chairman of a National Petroleum Council committee on emergency defense organization.

The study was requested last July by the Oil and Gas Division of the Interior Department as part of the Government's over-all planning for civil defense.

A subcommittee headed by H. G. Mangelsdorf of Esso Standard Oil Co., New York, has been assigned the task of determining methods to be used in providing continuity of oil-company operations in event of war. R. G. Arner of Sinclair Oil Corp., Chicago, heads the group studying advance preparations that might be made to reduce damage and facilitate the rehabilitation of refineries and terminals hit by bombs.

Weather Studies Available

WASHINGTON.—The Air Force, which has conducted a series of studies on weather conditions as they affect industrial operations, is making results of its studies available to the public.

The Air Force investigation "represents probably the most complete investigation of its kind ever made." The studies covered 28 industries, including oil refining. One of the reports covers "The Petroleum Industry in Cold Winter Environment."

Copies of the reports may be obtained from the Library of Congress, Publication Board Project, Washington 25, D. C.

New Mexico Leases Offered

WASHINGTON.—Twenty-six oil and gas leases in 18 producing fields in Eddy and Lea counties, New Mexico, will be sold by the Bureau of Land Management October 15.

The tracts cover 5,113.9 acres lying 10 to 40 miles east of Artesia, N. M. All are within known geologic structures.

Six of the parcels are in a potash area, and leases on those tracts will contain special limitations, including a stipulation that wells will not be drilled in locations which would interfere with extraction of the potash.

WATCHING WASHINGTON

Bertram F. Linz

Railroads Take to Diesels

The diesel-electric locomotive has been adopted by the larger railroads of the country in a big way.

Between 1950 and June of this year the number of diesels in service on Class I railroads increased from 14,047 to 23,361 while the total number of locomotives dropped from 40,494 to 34,432. The number of steam engines, both oil and coal, dropped from 25,640 to 10,374, and the number of electric locomotives dropped from 788 to 697.

The real record, however, is in the transportation service. The percentage of freight traffic handled by steam engines dropped from 53.91 per cent in 1950 to 14.47 per cent last May. Diesels increased from 44.13 to 83.35 per cent. In passenger service, steam-engine use dropped from 36.31 to 8.57 per cent while diesel use increased from 57.30 to 84.92 per cent. In yard service, steam dropped from 38.20 to 10.12 per cent while diesels jumped from 60.45 to 88.93 per cent.

The next development in railroad transportation may be an oil-fueled turbine engine, now being tried out by Union Pacific. The UP recently made tests with a propane-fueled gas turbine, but dropped it as unsatisfactory. Transportation experts, however, do not foresee that the turbine will create a railroad revolution like the diesel did.

Economic Remedies Ready

Industrial activity shows no signs of more than a normal seasonal upturn this fall and administration officials are beginning to think of ways to give it a shot in the arm.

If the Government resorts to pump-priming measures, President Eisenhower is determined they shall be programs of lasting value—not merely expedients to increase employment and activity temporarily.

The administration has had plans for meeting a recession under study for many months. As far back as last March, Commerce Secretary Sinclair Weeks disclosed the broad outlines of the policy that would be followed. It was then hoped that any set-back would be of short duration and would not call for Government action.

Several of the anti-recession ideas have already been embodied in legislation enacted by Congress. Among them are lower taxes, easier credit, and tanker construction. Highway construction has been expanded, but could be further increased. A big program of airport construction could be under way in a matter of months.

Top officials, however, appear to be undecided as to just where the danger point between a set-back and a recession falls. No particular figure of unemployment has been set as the warning signal which automatically would throw the Government machinery into action. The administration still is depending on the ability of industry to get itself back into high gear rather than in Government action to make jobs to merely tide workers over until the labor market improved.

Rubber Plant Sale Bogs

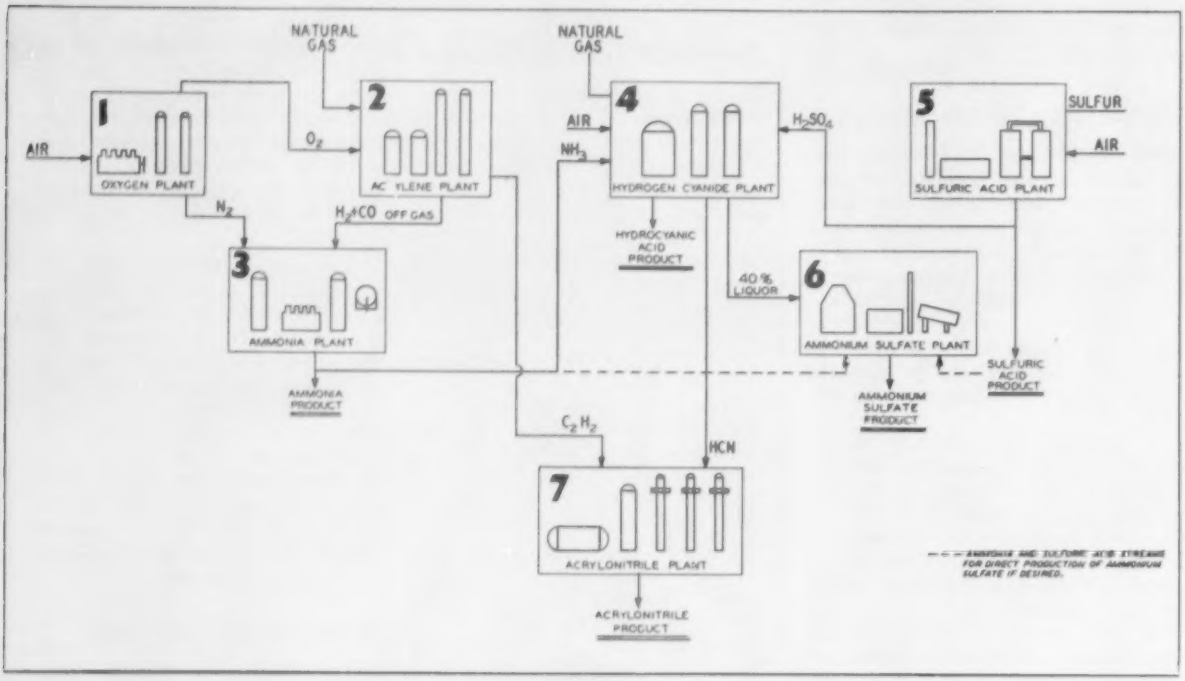
The sale of the Government's synthetic rubber plants to private industry shows signs of bogging down.

A sharp difference of opinion has developed between bidders and the disposal commission over the value of the war-built facilities. The commission says offers are far below the "full, fair value."

Several bidders reportedly have made new evaluations of the plants and are coming up with increased offers. Commission officials are not talking, and there is some doubt whether even the new offers fall within the range they have set as a target.

The law provides no sales program can be approved unless the facilities sold are capable of producing at least 500,000 long tons of general purpose and 43,000 tons of butyl rubber annually. The total rated capacity of the Government's 13 GRS plants is 860,000 tons and the two butyl plants are rated at 90,000 tons.

This would allow the commission to place 360,000 tons of GRS and 47,000 tons of butyl capacity in standby, to hang over the heads of private operators if they should not produce enough synthetic rubber to meet demand in the plants they buy or build. Production of the Government plants is slightly more than 40,000 tons a month.



Seven plants in one make . . .

. . . Versatile Petrochemical Giant

F. Lawrence Resen

NEW ORLEANS.—American Cyanamid Co.'s new Fortier plant, which utilizes natural gas and other raw materials in production of acrylonitrile, is one of the most versatile petrochemical plants ever built.

The $50,000,000 unit, located 18 miles upstream from here, actually is seven plants within a plant.

American Cyanamid's costly venture into big-scale production of acrylonitrile testifies to that product's growing importance in the petrochemical industry.

Discovered in 1893, acrylonitrile remained a laboratory curiosity until the middle 1930's. Since then it has been put to use in manufacture of such diverse products as synthetic rubber; fibers including Orlon, Acrilon, and Cyanamid's X-51 experimental product; plastics; adhesives; and soil conditioners. It also is used as a chemical intermediate.

In the seven-stop route through the recently completed plant some by-products are available from the basic raw materials of natural gas and water. These include ammonia, acetylene, hydrocyanic acid, and derivatives of these. But the emphasis is on acrylonitrile, to which all the plant's operations are directed.

1. Oxygen production . . . Air is liquefied and separated into 95 per cent oxygen and pure nitrogen streams in a tonnage oxygen plant.

The compressed air is passed through regenerator-type heat exchangers, into two high-pressure distillation columns, and finally into a low-pressure column for final separation.

2. Acetylene . . . Natural gas is partially burned in oxygen to produce acetylene and an off stream containing large amounts of hydrogen. The methane and oxygen gases are separately preheated to over 1,000° F., mixed in a high-velocity combustion chamber, ignited, and cooled immediately to prevent decomposition of the acetylene.

The reactor gases from the partial-oxidation burners are further cooled in a water scrubbing tower and passed through a coke-filled soot filter to remove carbon soot formed.

After leaving the soot filter, reaction gases from the eight combustion trains are combined, compressed, and introduced into an acetylene recovery system.

3. Ammonia . . . Acetylene off-gas and nitrogen from the oxygen plant are used to produce ammonia in a standard Chemical Construction Corp. synthesis plant.

4. Hydrogen cyanide . . . HCN is formed by burning natural gas and ammonia in air over a suitable catalyst. The three streams are mixed and enter large refractory brick-lined reactors where they react on catalyst at high temperatures.

The hot reaction gases are cooled, and the unreacted ammonia is removed from the reactor gases by scrubbing them with an ammonium-sulfate and sulfuric acid solution in the primary ammonia-absorption tower and then with dilute sulfuric acid in the secondary ammonia-absorption tower. Am-

monium sulfate solution is withdrawn continuously from the primary tower and sent to the ammonium-sulfate plant for recovery.

Ammonia-free reaction gases from the secondary absorber enter the HCN absorbers where chilled water is used to remove the HCN. The HCN is stored as a liquid under refrigeration until used in the acrylonitrile plant.

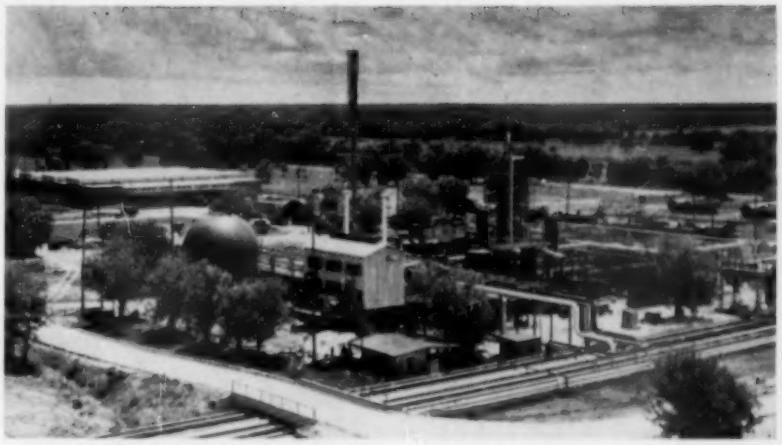
5. Sulfuric acid . . . A standard Chemico contact-acid plant is used for the manufacture of sulfuric acid which goes into HCN synthesis and also for sales. About 35,000 tons of acid may be produced annually from these facilities.

6. Ammonium sulfate . . . The ammonium sulfate solution from the hydrogen cyanide plant is pumped to a circulating concentrating system. Here the liquor is flash-evaporated under vacuum. Concentrated liquor drops into a crystallizer where a heavy crystal slurry forms. Part of this slurry is pumped into a continuous centrifuge, and the balance recirculated.

Ammonium sulfate crystals are recovered in the centrifuge and dried. Capacity of this plant is about 35,000 tons per year of recovered and manufactured sulfate.

7. Acrylonitrile . . . Acetylene and HCN react in the presence of a catalyst to produce acrylonitrile. Reaction products from the rubber-lined reactors are combined and enter the acrylonitrile absorber, where water removes most of the acrylonitrile, soluble byproducts, and unreacted HCN.

Acrylonitrile is steam stripped from the solvent, and further purification takes place in several distillation steps. Water, hydrogen cyanide, and lactonitril are removed in turn along with certain minor impurities. Final purification takes place in a vacuum column.



AMERICAN CYANAMID'S hydrocyanic-acid unit, with warehouse in background.

Background . . . Substantial production of acrylonitrile (which Cyanamid pioneered) started in the United States in 1940 after the discovery that a valuable synthetic rubber could be made from it. During World War II, acrylonitrile was diverted almost entirely to the synthetic-rubber program, making possible such items as bullet-sealing fuel tanks for aircraft and oil-resistant rubber.

The Fortier plant is on a 650-acre site on the west bank of the Mississippi River. It was designed to permit 100 per cent expansion of existing units plus addition of new units as they may be needed.

Natural gas is being supplied by The Texas Co., and the river serves as source of some 10,000,000 gal. of process water per day.

General contractor for the plant was Chemical Construction Co., Cyanamid subsidiary. J. A. Jones Co., North Carolina, handled a major portion of the civil work, with Boh Brothers of New Orleans driving all the 10,000-plus piles used in foundations. Plant manager is Gerard J. Forney.

ACRYLONITRILE unit at American Cyanamid Co.'s Fortier plant.

Magnolia Spuds In Gulf

HOUSTON. — Magnolia Petroleum Co. has spudded its first wildcat in the Texas tidelands in an attempt to establish production on 11,520 acres it leased from the state last December.

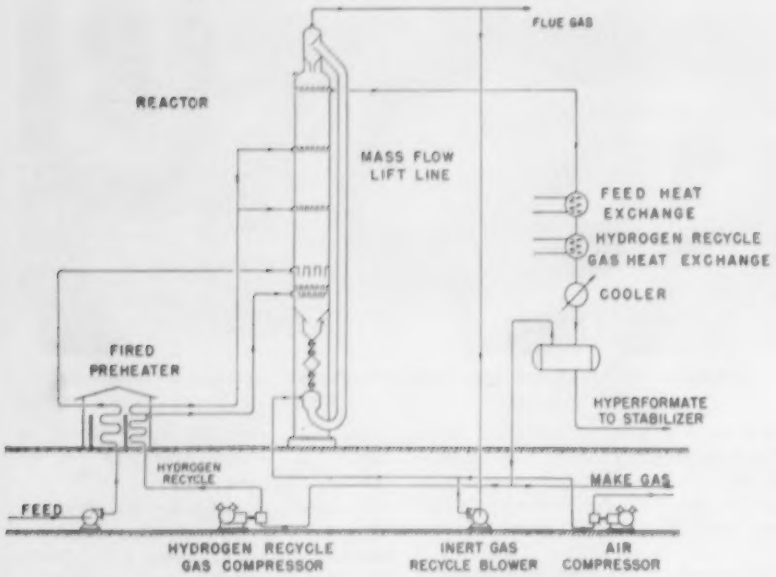
The well, 1 Gulf Tract 10, is projected to a depth of 13,000 ft. to test the Miocene sands. It is being drilled from a platform standing in 36 ft. of water, about 14 miles southwest of Sabine Pass.

The test is on one of two high-priced 5,760-acre blocks leased by Magnolia. The company paid $2,609,-180 for Block L-10 and $1,923,840 for adjoining Block L-9. Pure Oil Co. also entered exceptionally high bids for these two blocks, offering $1,029,-565 for Tract 10 and $1,544,555 for Tract 9.

Magnolia also holds L-24, a block of more than 5,000 acres south and west of Blocks 9 and 10.

The Magnolia platform is big enough to permit the drilling of five wells from one location. It is almost 400 ft. long. A separate platform providing living quarters for the crew is connected to the drilling platform by an 88-ft. causeway.

Nearest production to the drill site is at Clam Lake field, northwest and about 2 miles inland in Jefferson County.



Hyperformer Producing

First commercial unit of its kind converts heavy naphtha into gasoline with low sulfur content, A.S.M.E. is told

D. H. Stormont

LOS ANGELES.—The first commercial Hyperformer, in which catalyst regeneration is carried out in the lift line, is converting heavy straightrun naphtha into a high-quality gasoline of very low sulfur content.

Operations and yields of the new unit, located at the Long Beach refinery of Calstate Refining Co., were described by Clyde Berg of Union Oil Co. at last week's annual meeting here of the petroleum division, American Society of Mechanical Engineers.

The cobalt-molybdate catalyst is regenerated by a recycled flue gas containing less than 2 per cent oxygen. Attrition losses are held to a minimum because of the very low velocity of the catalyst in the Hyperflow lift line.

A catalyst circulation of approximately 860 lb. per hour is used at the 1,100-bbl. per day Signal Hill plant. Catalyst requirements amount to about 9 lb. per stream day, Berg said.

Feed stock being used consists of a blend of heavy straightrun naphtha obtained from a 2,500-bbl. topping and rerun plant, together with heavy thermally cracked naphtha obtained from visbreaking the resultant residuum. Material balances and product distribution in the operation of the Calstate plant are shown in one of the accompanying tables. A summary of the processing conditions employed is given in the other.

A yield of 91.7 per cent (volume) of pentanes-plus gasoline is obtained from the present charge, Berg stated.

Hyperforming Unit Products

Feed—	Bbl./S.D.	M.s.c.f./D.	°A.P.I.	Lb./hr.	Liquid yield, volume per cent	Yield, weight per cent
Naphtha	1,100	...	46.3	12,750	100.0	100.0
Products—						
C_5+ gasoline	1,008	...	48.2	11,560	91.7	90.8
Butanes	40	...	...	330	3.7	2.6
Polymer	6.6	...	24.0	87	0.6	0.6
Make gas	...	620	...	1,282	...	...
Coke	...	...	...	19.1	...	0.15
Coke equivalent for oxidation of H_2 and catalyst	...	...	...	(19.7)	...	...

Process Conditions

Reaction conditions:

Temperature, °F.	870
Naphtha preheat, °F.	870
Recycle gas preheat, °F.	850
Interheater preheat, °F.	1050
Pressure, psig.	400
Space velocity, volume of naphtha per volume catalyst in reactor	1.0
Catalyst to oil ratio, volume catalyst circulated per volume of naphtha	0.05
Recycle and interheater gas, SCF/bbl. naphtha	3600
Recycle gas, hydrogen content, mol. per cent	65
Regeneration condition:	
Regeneration temperature, °F. avg.	950
Pressure, psig. avg.	415
Coke load, wt. per cent feed	0.15

This blends to a 104.4 per cent yield of 10-lb. R.v.p. gasoline through the addition of 9 per cent outside butanes. The gasoline, which has a sulfur content of 0.007 per cent (weight), has an F-1 plus 3 cc. TEL octane rating of 93.7.

"The reactor is fabricated from low chrome-moly steel," Berg said in describing the new Hyperformer. "All other vessels are fabricated of carbon steel. No refractory liners are used in the reactor or catalyst-transfer lines. The high-temperature furnace tubes and transfer lines are of alloy."

Long Beach Ruling Delayed

LOS ANGELES. — The California Supreme Court is expected to rule in about 3 months on Long Beach's much-disputed proposal to use "excess" tidelands oil funds for general city purposes.

Oral arguments of Long Beach's attorneys and those representing various clients contesting the city's right to spend 50 per cent of the funds for upland improvements were heard by the court here last week.

At stake is from $78,000,000 to $100,000,000, depending on whether or not revenues from dry gas are considered in the ruling.

Main issue is whether a 1951 legislative act released 50 per cent of the tidelands oil revenues and all of the dry-gas revenues for upland civic improvement purposes, as it purported to do. The state in 1911 granted the tidelands to the city, but with the restriction that any revenues should go only for specific purposes—primarily harbor improvements.

Attorneys opposing the city's ownership contended Long Beach is only a trustee handling tidelands funds and that the money should go to the "beneficiary," the people of California.

How to Beat Corrosion

Tempering after normalizing may extend life of tubing, A.S.M.E. told; overcoming hydrogen blisters outlined

LOS ANGELES.—A promising means has been developed to extend the life of high-strength tubing in wells threatened by sulfide corrosion cracking.

Two Shell Development Co. researchers, J. P. Fraser and R. S. Treseder, say laboratory tests show the life of tubing can be lengthened by following the usual normalizing heat treatment with a tempering treatment.

They made their report here last week at the annual meeting of the petroleum division of the American Society of Mechanical Engineers.

The role of H_2S in causing hydrogen blisters in gas transmission lines was described by Felipe Paredes and W. W. Mize, El Paso Natural Gas Co. Another type of corrosion and the methods of combating it were described by B. B. Morton, International Nickel Co. Morton reviewed the use of corrosion resistant materials in the splash area of offshore steel structures.

Sulfide corrosion . . . Fraser and Treseder said they have not been able to determine if all tubing steels meeting N-80 requirements will respond as well as those tested. Their tests show the tempering treatment has promise of giving these steels a resistance to sulfide corrosion similar to J-55 steels—yet retaining the high mechanical properties of N-80 steels.

The pair said tests revealed a wide range in the stress potential among materials of nominally similar mechanical and chemical properties, and presumably with similar metallurgical histories.

The tests also showed better performances are consistently attained with J-55 steels, and that 9 per cent nickel steels have a high rate of sulfide corrosion cracking.

The cracking resistance of N-80 steels can be substantially improved by tempering the steels for approximately 30 minutes at 1,100° F.

Hydrogen blisters . . . The El Paso Natural representatives said hydrogen blisters are caused by atomic hydrogen penetration and conversion of atomic hydrogen to molecular hydrogen at internal breaks in the steel.

They said most of the breaks are found in the lower portion of the pipe where there is a high concentration of water. El Paso Natural has prevented breaks by using organic corrosion inhibitors.

Splash-zone production . . . Morton said Monel, with its corrosion resistance and good mechanical and welding properties, is the best protection for the splash zone. Monel sheathing is considered more economical than Monel clay steel.

Richfield Brass at Refinery Open House

Several thousand persons attended a series of open houses at Richfield Oil Corp.'s recently expanded Watson Refinery. Company officials greeting some of the visitors are (left to right) R. P. Corlew, assistant manager of refineries; Charles S. Jones, president; David E. Day, vice president and manager, manufacturing and pipeline department; and C. R. McKay, manager of refineries. A $40 million expansion was recently completed at the 140,000-bbl. refinery.

"Major" Revealed

Richfield leases 500 acres of Long Beach upland area

LONG BEACH.—Richfield Oil Corp. is the "major company" for which a Long Beach firm has been obtaining leases in the upland area here during recent months.

R. A. Keans, of Keans, Springmann & Stipek, Inc., made the disclosure here last week. Nearly 500 acres of the approximately 800 acres believed productive has been leased for Richfield Keans said. This represented nearly 2,100 separate lease negotiations, for which a bonus of $250 per acre per year was paid. Landowners will receive 25 per cent royalty on any oil production.

How and when the triangular area west of Pine Avenue will be developed is yet to be determined. Unitization of the thousands of small tracts with the City of Long Beach's offshore holdings possibly will be required. Whether or not the city has the right to unitize its properties is yet to be clarified by voting.

State Gets Offshore Income

WASHINGTON. — California was richer by more than $49,000,000 last week and the books were closed on the dispute whether the state or the federal Government owned the state's offshore oil resources.

The Interior Department turned over a check for $22,041,994.66 to California and at the same time released another fund of $26,997,223.49 held in escrow since 1947.

The $22 million represents royalties collected for oil and gas leases in the 3-mile area off California since 1950. The larger amount was income from the same sources deposited by California in a special fund between 1947 and 1950.

Congress resolved the dispute over which government would have control off the offshore lands in 1953.

New Spraberry Approach

Humble believes conventional water flood will coax more production from tight Texas formation; plans experiment

AUSTIN.—A different approach to the problem of wresting more oil from the tight Spraberry sand of West Texas was laid before the Texas Railroad Commission last week by Humble Oil & Refining Co.

Humble is seeking a 1-year permit to conduct an experimental five-spot water flood in the 7,200-ft. Spraberry underlying its L. H. Shackelford "B" lease in the field.

Unlike the water-imbibition experiments conducted by Atlantic Refining Co. and Tex-Harvey Oil Co., the Humble project would be a conventional flood. Humble said laboratory experiments with an electric analog and a core containing a "suitable connecting set" of man-made fractures has led it to believe that the Spraberry can be effectively flooded by a normal water-flood operation.

The Shackelford lease contains 1,320 productive acres. It now has six wells which produced an average 31 bbl. daily during August. Cumulative production to the first of September was 221,256 bbl., and the lease is considered in the intermediate stage of depletion. The first well was completed in October 1951.

Salt water for injection will be obtained from the San Andres formation encountered from 4,100 to 5,000 ft. The water will be injected at a pressure of 500 psi. through a closed type system in a five-spot, 80-acre pattern. Initial water input will be about 1,500 bbl. per well per day.

Three producers will be converted to injection service. The producing well and the fourth input well will be drilled.

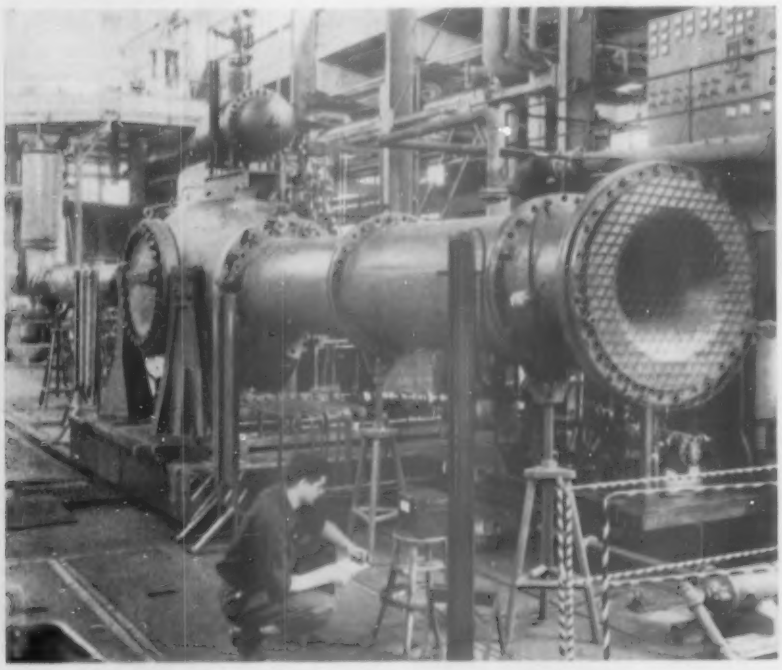
Lab experiments . . . Humble's first and most-basic study of the possibilities of a successful water flood in the Spraberry involved substituting certain properties of an electrical system to represent the physical conditions respecting the flow of fluids through the formation. An electrical current was used to simulate fluid flow, an electrical potential for pressure, and electrical capacitance for compressibility, etc.

Results of these tests indicated that water injected into a fractured formation would displace appreciable oil from the matrix rock. The amount displaced, the researchers found, depended on the ratio of the permeability of the matrix to the permeability of the fractures.

Results of the analog study were checked with a test core. The sandstone core was sliced into thin disks. Each disk was broken into two segments and reassembled as snugly as possible. The rebuilt core was saturated with oil and connate water and flooded.

The test not only showed that oil could be flooded out of the matrix, but that practically no channeling of water occurred. Nearly all of the recoverable oil was displaced prior to water breakthrough.

These lab results indicate that the Spraberry can be water flooded conventionally if the fracture frequency and width are favorable, according to Humble engineer W. L. Crothers. The only way to determine if this is the case is to carry out the projected field trial, Crothers told the commission.



Newest In Centrifugal Compressors

The newest development in centrifugal compressors is this Worthington Corp. single stage unit which will be installed at Northern Natural Gas Co.'s Macksville, Kans., booster station. The compressor, Worthington's first in the centrifugal line, was designed primarily for gas pipeline transmission. At Macksville it will be the first-stage unit in a four-unit station and will be driven by a 5,700-hp. two-shaft General Electric gas turbine. It is designed for a rated flow of 748 million cubic feet per day with a suction pressure of 434 psi. and a discharge pressure of 500 psi. Its nominal operating speed of 4,750 r.p.m. requires 5,200 hp.

Refinery to Shut Down

SWEETWATER, Tex. — Gulf Oil Corp. will close its 25-year-old refinery here November 21.

The refinery is not equipped to manufacture gasoline for today's high-compression engines and has been operated at a loss for the past several years, according to B. H. Barnes, general manager of Gulf's manufacturing department.

The Sweetwater plant has a crude charge capacity of 8,325 bbl. daily, with 4,440 bbl. daily in thermal cracking capacity. It is the second of Gulf's three refineries in Texas to be shut down this year. The company closed its 9,435-bbl. Fort Worth refinery earlier this year for the same reasons.

The action leaves Gulf's huge plant at Port Arthur, capable of charging 271,950 bbl. of crude daily, as the company's only refinery in the state.

Gas Contract Made

One of first big agreements since Phillips case signed

HOUSTON.—Natural Gas Pipe Line Co. of America has signed a 20-year contract with a group of Houston investors for the purchase of 60 million cubic feet of gas daily from properties in Wise County, Texas.

The agreement is one of the first big-scale contracts signed since the Supreme Court's June 7 ruling in the Phillips case.

The company plans to lay a 280-mile line from Wise County to Panhandle field in Texas, where the firm's parent organization, Peoples Gas & Light Co., has a line to Chicago.

It also is proposed that Warren Petroleum Corp. build a gasoline plant in Wise County to strip propane and butane from the gas.

The projects hinge on Federal Power Commission approval of the gas contract and pipeline.

The pipeline company will pay a minimum of 15 cents per M.c.f. and a maximum of 17 cents per M.c.f. for the gas, depending on the B.t.u. content. The pipeline will be designed for a daily capacity of 150 million cubic feet daily and cost $1,500,000.

Twenty per cent of the Wise County operation is owned by Christie, Mitchell & Mitchell, Houston. Several associates own the remaining 80 per cent.

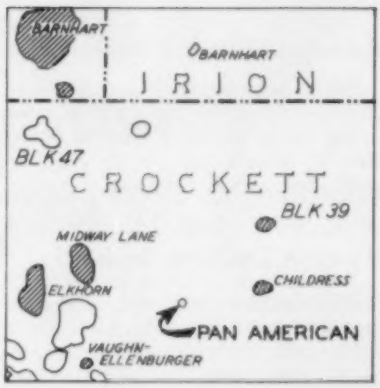
Texas Land Auction Set

AUSTIN.—The University of Texas School Land Board will auction off more than 33,000 acres of oil and gas leases in nine West Texas counties December 3.

Most of the 113 tracts offered for lease will be relatively small, ranging up to about 400 acres. They are located in Crockett, Reagan, Irion, Pecos, Ward, Winkler, Andrews, Crane, and Upton counties.

Four of the tracts, however, contain between 1,000 and 3,000 acres. These include: 2,574.2-acre block in Andrews County, a 1,979.1-acre tract in Upton and Reagan counties, a 1,171.99-acre tract in Reagan and Crockett counties, and 2,562.8 acres in Ward County. All four of these leases will carry a clause requiring the spudding of a well within 180 days of the date of the sale.

The board also is inviting operators to submit lists of acreage in the Gulf of Mexico which they desire to have offered for lease at a December sale. Bascom Giles, land commissioner, said the nominations should be filed no later than October 20.



ELLENBURGER STRIKE in relation to other pools in Crockett County. Shaded areas are Ellenburger fields.

Ellenburger Strike

Tests show 107-ft. section in West Texas Pan Am well

OZONA, Tex.—A new Ellenburger-producing structure of sizable proportions is indicated for northeastern Crockett County, West Texas.

Initial drill-stem tests at Pan American Production Co. and Murphy Corp. 1 W. E. West, 20 miles northwest of here, flowed oil over a 107-ft. section.

Heavy flows of oil were reported on four drill-stem tests, with no water on two, and slight shows of salt water on two more. These tests and results were: At 8,005-34 ft., the well flowed oil but the amount was not estimated; at 8,030-ft. oil surfaced in 27 minutes and flowed at the rate of 60 bbl. an hour; third test, at 8,053-73 ft. also rated 60 bbl. an hour with pressure holding around 1,375 psi.; and the last test to be reported, at 8,073-93 ft., flowed at the rate of 40 bbl. an hour. Testing continued at 8,113 ft.

Bradley Buys Condor Control

DALLAS.—Bradley Oil Co., Dallas, revealed last week that it has purchased an additional $12,000,000 worth of shares in Condor Petroleum Co., Abilene, Tex., giving it a controlling 76 per cent interest in the company.

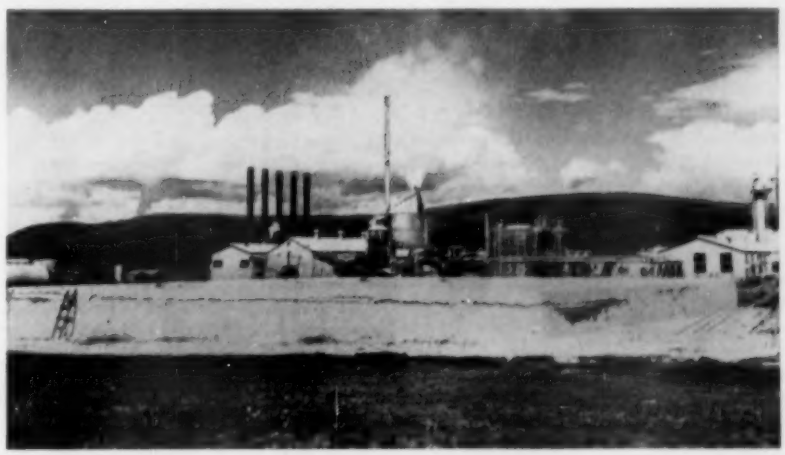
Bradley acquired 1,897 shares of Condor stock for $7,500,000 last spring. Bradley, a subsidiary of San Juan Exploration Co., now holds 5,004 shares of Condor's total 6,689 shares.

The latest stock purchase was made from the estate of Ellis A. Hall, founder of Condor who was killed in a plane crash in 1953.

More Gas Injection Proposed

AUSTIN.—Stanolind Oil & Gas Co. has asked the Texas Railroad Commission for permission to conduct a second pilot gas-injection project in Midland Farms field, Andrews County.

The first pilot, launched in January 1953, has been injecting gas simultaneously into the full open section of the two producing zones "A" and "B" of the Grayburg formation. The projected second pilot involves gas injection into these two zones individually in a section of the field where only the two zones are present.



Things Jumping at Jumping Pound

Massive blocks of elemental sulfur—some weighing as much as 2,400 tons—are stockpiled outside Shell Oil Co. of Canada's natural-gas and sulfur plant at Jumping Pound, Alberta. A multimillion-dollar expansion nearing completion will boost the plant's natural-gas capacity from 35 million to 60 million cubic feet daily and its sulfur output from 30 to 80 tons daily. The added natural gas will be sold to Canadian Western Natural Gas Co. for sales in southern Alberta and the sulfur will go to Gunnar Mines, Ltd., for conversion to sulfuric acid to be used in leaching uranium ore at Lake Athabaska in northern Saskatchewan.

CANADA

Big Reserves Seen

Manitoba fields expected to reach peak by 1956

WINNIPEG.—J. C. Sproule & Associates has estimated proved reserves in the Daly, Virden-Roselea, and North Virden-Roselea oil fields of Manitoba at 19,600,000 bbl.

The firm estimates a probable recovery of at least 9,100,000 bbl. of oil from these fields.

Its survey, prompted by a new crude line being built in the area, indicates production from the three fields should rise to 7,500 bbl. daily by the end of 1954 and increase to a peak of 19,800 bbl. a day by 1956. After that, production is expected to drop to 14,000 bbl. per day by 1958, after which a slower decline is expected to drop output to 4,255 bbl. daily in 1964.

Average daily production in July, latest month for which official figures were available, was 6,054 bbl. daily from 158 wells. There are now more than 190 producing wells in these three fields and more than 200 in the entire province.

The geological report anticipates an increase in known reserves during the next 5 years as result of additional oil discoveries in the Lodgepole formation. It forecasts a peak production rate for the area continuing for 5 or 10 years after production starts to decline in the Daly-Virden fields.

Alberta to Get Deep Tests

CALGARY.—A group of major oil companies has agreed to conduct an extensive 3-year exploration program in western Alberta on a 956,000-acre farmout from Bailey Selburn Oil & Gas, Ltd., Calgary.

Under the agreement, the major companies will spend an estimated $3,500,000 or more in exploring the area. A major portion of the work is to be done within 15 months.

The land, all lying in the foothills and semifoothill regions, was farmed out to Canadian Gulf Oil Co., Sinclair Canada Oil Co., Texaco Exploration Co., Trinidad Leaseholds (Canada), Ltd., and Cie. Francaise des Petroles. In return for their exploration work, these companies will acquire an average interest of about 52½ per cent in the petroleum and natural-gas rights on the acreage.

The exploration program is expected to include about nine deep wildcat tests.

Bailey Selburn also announced it is considering farming out 125,000 acres in the Clearwater River area of West-Central Alberta and in the Bindloss district of eastern Alberta.

Pipeline Delivery Boosted

EDMONTON.—Oil deliveries over the Interprovincial Pipe Line Co.'s 1,750-mile line from Edmonton to Sarnia, Ont., are averaging 165,000 bbl. daily, compared with 135,000 bbl. a year ago, T. S. Johnston, Toronto, president, said here recently.

Johnston said new construction in Canada this year amounts to an outlay of $38,000,000. This involves extensions to the loop system, requiring 455 miles of 24-in. pipe in Canada and additions to pumping stations.

All spreads on the 1954 program have been completed except 124 miles in the Alberta sector.

Canadian Line Under Way

VIRDEN, Man.—TransPrairie Pipe Lines, Ltd., has started construction on a 13-mile, $265,000 pipe line and crude gathering system in the Virden area of southwestern Manitoba that will tie the Virden-Roselea and North Virden-Roselea fields into the Interprovincial Pipe Line Co.'s system.

Contract for the construction of the line was let to Henuset Bros. Pipe Line Contractors of Virden whose crews have already strung pipe along the route of the new line and are currently carrying out ditching operations.

Alberta To Auction Leases

CALGARY.—The Alberta Government will auction oil leases October 19 on 219,384 acres, including 8,003 acres in vicinity of producing fields.

Proved or semiproved leases to be sold cover 3,521 acres in the Pembina field area. Other such tracts are in Erskine, Hamilton Lake, Joarcam, Joffre, Rimbey, and Sturgeon Lake fields.

ECONOMICS

Crude Imports Drop

Gasoline, distillates share 50,000-bbl. export decrease

IMPORTS of crude and products dropped below 1,000,000 bbl. daily in July after the jump to 1,052,000 bbl. daily in June. Exports were the lowest since March.

Figures compiled by the Census Bureau of the Department of Commerce show that imports averaged 979,000 bbl. daily in July, including 657,000 bbl. daily of crude and 322,000 bbl. daily of products.

The average reported for crude imports was 24,000 bbl. daily less than in June but 7,000 bbl. daily more than in May.

The 24,000 bbl. daily crude decrease, compared with May, due to a reduction of 28,700 bbl. daily from the Middle East and 7,200 bbl. daily from Latin America, was partially offset by gains from Canadian and Fart East crude.

Exports down . . . Decreases in exports of gasoline and distillate fuels accounted for a large part in the net drop of 50,000 bbl. daily in total exports.

Exports of lube oils decreased 6,800 bbl. daily from June but still averaged 41,000 bbl. daily. Lube exports in 1953 exceeded 40,000 bbl. daily only in December. Averages above 40,000 bbl. daily have been reported for 5 out of the 7 months so far this year.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	July 1954	June 1954	July 1953
Crude—			
Mexico	47	206	381
Colombia	1,069	1,210	1,340
Venezuela	10,092	9,761	9,277
Peru	120		
Kuwait	4,497	4,295	3,807
Saudi Arabia	2,652	3,072	2,490
Iraq		406	
Qatar	183	184	172
Canada	199	156	158
Far East	1,520	1,151	1,662
Total crude	20,379	20,441	19,287
Daily average	657	681	622
Products—			
Residual fuel	8,382	9,532	8,758
Other products	1,600	1,594	994
Total products	9,982	11,126	9,752
Daily average	322	371	315
Total all oils	30,361	31,567	29,039
Daily average	979	1,052	937

IMPORTS*

	July 1954	June 1954	July 1953
Crude	1,073	1,372	1,232
Gasoline	2,322	2,811	2,715
Kerosine	397	228	403
Distillate	1,695	2,158	2,118
Residual	1,883	1,793	1,398
Lube oils	1,271	1,435	1,105
Other products	920	941	716
Total all oils	9,561	10,738	9,687
Daily average	308	358	312

* Excludes shipments to territories.

World Output Down

Foreign production rise fails to balance United States July cutback; output drops 149,000 bbl. daily from June

PRODUCTION cutbacks in the United States in July forced total free world crude-oil output to its lowest level since last January.

Crude production of the non-Communist world averaged approximately 12,156,200 bbl. daily during the month, down 149,300 bbl. daily, or 1.2 per cent, from June.

Output from fields in the United States dropped back from 6,500,000 bbl. daily to 6,242,000 bbl., a decline of nearly 4 per cent.

Foreign production, mostly the Middle East, continued its upward trend, but the July increase was more than offset by the drop in the United States. Total non-Communist foreign production gained 108,700 bbl. daily, or 1.9 per cent over June, to reach a new record of 5,914,200 bbl. daily.

The July production figures showed output in the United States at only some 328,000 bbl. daily above the non-Communist foreign total. If the present trend continues, United States production will fall below the foreign total in another year or less.

Figures for the first 7 months of 1954 illustrate the much greater relative growth of production outside the United States. During this period, total free world production averaged 12,199,000 bbl. daily, an increase of 391,000 bbl. daily, or 3.3 per cent, over the same period of 1953.

During this same 7 months, non-Communist foreign production rose 495,500 bbl. daily, or 9.4 per cent. The gain in the Middle East during this period was 266,390 bbl. daily, or 11.1 per cent. Venezuela's average for the first 7 months was 1,864,800 bbl. daily.

Middle East rises . . . Crude production in the Middle East during July rose 73,700 bbl. daily. This increase cancelled out the decline in Middle East output the previous month. The average of 2,758,700 bbl. daily in the Middle East during July was only slightly under the record 2,767,600 bbl. daily last March.

In Iraq, July production climbed to a new high for the country. Of the total, 501,000 bbl. daily came from Kirkuk field, 102,000 bbl. daily from Zubair, 26,800 bbl. daily from Ain Zalah, and 12,000 bbl. daily from Naft Khaneh. It was the first time that output from Zubair in southern Iraq had gone above the 100,000 bbl. daily mark. Basrah Petroleum Co., Ltd., which operates Zubair field, is building the first separator station at Rumaila field west of Zubair where it made a discovery last year. Commercial production from Rumaila probably will begin sometime next year, though output of the two fields will be limited to capacity of the pipelines to the tanker terminal at Fao.

Another production record was established in Qatar where output also rose above 100,000 bbl. daily for the first time. The field in this shaikhdom, Dukhan, is operated by Qatar Petroleum Co., Ltd., also associated with Iraq Petroleum Co., Ltd.

Kuwait's production climbed 64,000

TREND OVER THE LAST YEAR
(Thousands of barrels daily)

	Western Hemisphere less U.S.	Middle East	Total non-Communist foreign
1953—			
August	2,443.3	2,489.0	5,387.3
September	2,485.7	2,416.4	5,345.3
October	2,519.5	2,528.1	5,511.5
November	2,651.9	2,341.7	5,461.6
December	2,711.9	2,540.2	5,714.1
1954—			
January	2,682.8	2,491.2	5,636.4
February	2,703.7	2,550.6	5,695.3
March	2,642.9	2,767.6	5,872.7
April	2,565.1	2,642.0	5,653.1
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	5,205.5
July	2,680.9	2,758.7	5,914.2

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	July 1954	June 1954	July 1953
W. Hemisphere:			
Argentina	78.0	80.0	78.3
Bolivia	3.5	3.5	1.3
Brazil	2.1	2.1	3.0
Canada	290.0	262.3	259.9
Chile	4.5	4.5	3.0
Colombia	107.4	113.5	107.2
Cuba	0.1	0.1	0.1
Ecuador	8.5	8.6	7.8
Mexico	230.0	233.0	201.4
Peru	48.0	47.6	45.0
Trinidad	64.5	64.5	60.5
Venezuela	1,844.3	1,828.8	1,731.4
Total	2,680.9	2,648.5	2,498.9
W. Europe & Africa			
Algeria	1.6	1.7	1.9
France	9.1	8.4	7.1
Fr. Morocco	2.3	2.5	2.0
W. Germany	52.3	51.5	43.2
Italy	2.3	1.5	1.8
Netherlands	18.5	18.2	16.1
Egypt	38.0	38.2	46.5
United Kingdom	1.2	1.2	1.1
Total	125.3	123.2	119.7
Middle East:			
Bahrain	30.2	30.1	30.1
Iran	36.5	34.3	37.9
Iraq	641.8	636.6	592.0
Kuwait	976.2	912.2	869.5
Neutral Zone	20.0	16.0	
Qatar	101.5	99.8	95.1
Saudi Arabia	951.5	955.2	909.7
Turkey	1.0	0.8	0.6
Total	2,758.7	2,685.0	2,534.9
Other Asia:			
British Borneo	99.5	100.0	101.1
Burma	3.5	3.5	2.5
India	7.0	7.0	6.3
Indonesia	215.0	214.7	204.7
Japan	6.0	5.6	5.9
New Guinea	13.1	12.8	5.0
Pakistan	5.2	5.2	4.2
Total	349.3	348.8	329.7
Total, non-Communist foreign	5,914.2	5,805.5	5,483.2
United States	6,242.0	6,500.0	6,603.2
Total Free World	12,156.2	12,305.5	12,086.4
Est. Russia & E. Europe:			
Russian Zone of Austria	62.0	62.0	65.0
Romania	110.0	110.0	95.0
Russia	1,160.0	1,160.0	1,060.0
Other Communist	36.8	36.8	34.6
Total	1,368.8	1,368.8	1,254.6
World total	13,525.0	13,674.3	13,341.0

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these regions. Estimates also have been made for certain other countries, particularly in Southeast Asia, for which completely current reports are lacking. Iranian production shown is net output, the gross less recycled material. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

bbl. daily during July, while Saudi Arabia showed a relatively slight decline of about 4,000 bbl. daily. Of all the countries of the Middle East, definite production figures are lacking only for the Neutral Zone which discontinued issuing such data last March. However, the Neutral Zone estimates shown are in line with information available in the industry.

Venezuela up . . . Production in the Western Hemisphere, exclusive of the United States, rose slightly during July, mainly as a result of an increase in Venezuelan output. Production from this major oil country has fluctuated between 1,828,000 and 1,872,000 bbl. daily since last March. Venezuelan output hit a record of 1,935,200 bbl. daily last January.

The most significant production development in Europe was another increase in metropolitan France. This was due to the start of operations in the Parentis area in the southwestern part of the country where Esso Francaise, S.A.F., made a discovery last spring. Another gain in production was reported in Italy as a result of output in Sicily from Gulf's new field at Ragusa. The Gulf production is the first commercial oil on this Mediterranean island.

New Stanlow Unit Finished

A sulfuric-acid plant capable of manufacturing 33,000 tons a year has been placed in operation at Shell's Stanlow refinery in Cheshire, England.

In 1952, Shell built a sulfur-recovery plant a Stanlow, and this unit is now producing about 15,000 tons a year. The recovery unit and the new acid plant will allow Stanlow to become the only refinery in the United Kingdom which is entirely self-sufficient for its supplies of sulfur and sulfuric acid. All of the acid production will be used in the refinery for treating and improving lubricating and white oils and in the manufacture of detergents and petroleum-based chemical derivatives.

Gulf Explores Mozambique

Mozambique Gulf Oil Corp. is carrying out seismic work with two parties working in the northern part of its concession in the Portguese territory of Mozambique in East Africa.

The company drilled two dry holes about a year ago in the southern part of its concession, and is now investigating the prospects to the north. The rig was stacked after the two tests. One went to 10,455 ft., and the other to 8,846 ft.

SIGNING THE JOINT EXPLORATION agreement between Pakistan and Standard-Vacuum Oil Co. at the Pakistan Embassy in Washington: seated, left to right, H. W. McCobb, vice president and director of Standard-Vacuum, and Syed Amjad Ali, Pakistan's ambassador to the United States. Standing, left to right: T. M. Davis and R. W. Wales, both of the law department of Standard-Vacuum; R. A. Marriner, of Standard-Vacuum's economic coordination department; W. W. Geddes, the company's Washington representative; C. C. A. Beels, chief Standard-Vacuum landsman; Syud Ahmed, press attache, M. Shafqat, first secretary, and M. Iqbal, commercial secretary, all members of the embassy staff. (A Standard-Vacuum photo).

Stanvac, Pakistan Sign

Exploratory agreement on two 10,000-square mile regions gives Pakistan quarter interest in operating company

STANDARD-VACUUM OIL CO. has taken out two exploratory concessions in Pakistan under an agreement which gives the government a 25 per cent participation in addition to the usual 50-50 profit sharing.

Each concession includes 10,000 square miles, one in West Pakistan and the other in East Pakistan. The government-company agreement was signed in Washington by Syed Amjad Ali, Pakistan ambassador to the United States, and H. W. McCobb, vice president and director of Standard-Vacuum.

Terms of the agreement are similar to those in the agreement which the company negotiated the latter part of last year with the Indian Government for a 10,000-square mile concession in the Bengal Basin adjoining East Pakistan *(The Oil and Gas Journal, January 18, page 66)*.

The Pakistan Government will provide 25 per cent of the costs of exploration, and Standard-Vacuum the other 75 per cent. On this basis, the government has agreed to invest funds in the operations up to a maximum of $15,000,000. The government will share in ownership of any crude oil discovered on the same basis as its participation in the exploration costs, and the company has agreed to purchase the government's 25 per cent share at wellhead value.

Other terms provide that Standard-Vacuum will manage the joint operation and keep the government informed in detail of the progress. The company has agreed to train Pakistan nationals for all phases of the operation. Furthermore, if commercial production is obtained, the company has agreed to discuss with the government the erection of a refinery in Pakistan.

Concession areas . . . The areas to be explored are in the Ganges River delta of East Pakistan and in the Indus River Valley of West Pakistan. A preliminary study of the Ganges delta was made about 2½ years ago by Standard-Vacuum in an aerial magnetometer survey. With the concession agreement finalized, arrangements already are under way to undertake detailed geological and geophysical work.

The fact that Standard-Vacuum was negotiating with the Pakistan Government has been known for more than a year. The Caltex organization through its affiliated American Overseas Petroleum, Ltd., has also been discussing possible exploratory work with the government in Pakistan. The Indian Government has been seeking to interest

Caltex as well as Burmah-Shell in exploratory operations, but the most promising and accessible part of the Indian section of the Bengal Basin was covered by the Standard - Vacuum agreement.

Exploratory work has been under way without success in East Pakistan for the last several years. Pakistan Petroleum, Ltd. (Burmah Oil Co., Ltd.) has drilled several deep tests without finding production. In West Pakistan, this same company has been more successful. In 1952, it discovered the Sui gas field in Baluchistan and a pipeline is now being built to move the gas to Karachi. The only oil production in Pakistan comes from a group of four small fields in the Punjab of West Pakistan which are operated by Attock Oil Co., Ltd., and Pakistan Petroleum. The Attock company operates a 5,000-bbl. daily refinery at Rawalpindi processing the domestic crude. The refinery is the only one in Pakistan.

Price Row Settled

Wells on Sinai Peninsula to start production soon

THE Southern California Petroleum Corp., operator for International Egyptian Oil Co., Inc., in the southern part of the Sinai Peninsula, hopes to begin commercial production from the Feiran wells in the near future.

Tyler F. Woodward, Southern California Petroleum president, said in New York that separate facilities to receive the low-gravity Feiran crude are now being built at the Egyptian Government's Suez refinery and that these should be finished within a few weeks.

Production has been held up by now-settled oil pricing dispute between the government and the other two operators in the country, Anglo-Egyptian Oilfields, Ltd., and Socony-Vacuum Oil Co., Inc. Feiran crude will be delivered to the government refinery on the Middle East price basis and will sell for around $2.05 a barrel. The crude is of 23.8° gravity.

The company has completed two 10,000 bbl. field tanks, and these have been filled. It also has built a temporary marine loading terminal in order to ship the production.

A location for Feiran 3 has been made about 1,500 ft. south and slightly west of Feiran 2, and this well is to be undertaken as soon as a rig becomes available. The company has run into a severe fishing job due to drill-pipe failure in its wildcat at Belayim about 6 miles south of Feiran. This test has been taken to 5,104 ft.

Dusters Hit Australia Body Blow

EXPLORATORY work in the Exmouth Gulf area of West Australia met major disappointment as a result of negative results in two current wells, Rough Range 3 and Cape Range 1.

West Australian Petroleum, Pty., Ltd., failed to find oil in the second stepout drilled on the Rough Range structure where it made Australia's first commercial oil discovery last November.

Rough Range 3 was a failure in the basal Cretaceous at around 3,900 ft. It was this formation, the Birdrong, which produced at a rate of around 550 bbl. daily at 3,605-20 ft. in the discovery. No. 3 was located 3,000 ft. northeast of the discovery. Earlier, the company abandoned as dry its Rough Range 2, located 6,362 ft. southwest of the discovery.

The Cape Range well, drilled on the much larger structure to the north, found only salt water in the formation which was productive in the Rough Range discovery. The company continued drilling at about 3,850 ft. with plans to carry the hole deeper. Some shows were obtained above and below the section productive in the Rough Range discovery.

The discouraging results since the Rough Range discovery seem likely to take the edge off the West Australian oil boom. The significance of the Rough Range discovery now appears to lie in the fact that it proves the existence of commercial oil in this part of Australia. Apparently it is not as easy to find or in as large a quantity as originally hoped. Further intensive geological study and carefully planned drilling will be in order.

West Australia Petroleum is owned 80 per cent by Caltex with its affiliated American Overseas Petroleum as the operator. The other 20 per cent is held by the Australian company Ampol. Ampol stock, which boomed after the discovery, has declined further on the latest drilling results.

North Spain Tested

Americans, government join in second Spanish wildcat

A COMBINE of American oil interests in partnership with the Spanish Government was drilling ahead at 4,737 ft. in gray limestone last week in its second wildcat test in northern Spain.

The Castilfrio test is about 15 miles northeast of the community of Soria and about 75 miles southeast of the group's first failure east of Logreno.

The Castilfrio well is on the Oncala anticline, a surface structure in the mountainous country northeast of Madrid. The location is atop a 300-ft. hill at an altitude of 6,000 to 7,000 ft.

The heavy rig being used is in the 15,000-ft. class. It was purchased from Delta Drilling Co. by the Spanish Government company Institute Nacional de Industria and made available for the Castilfrio venture. The crew was furnished by Delta.

Test develops water . . . Little is known geologically of subsurface formations in the area of the test. The well started spudding in the Lower Cretaceous and encountered highly abrasive sandstone for the first few thousand feet. A large number of bits were consumed in drilling through this formation. A drill-stem test of the 4,546 to 4,601 ft. interval was taken after slight staining was detected in a core taken from 4,584 to 4,600 ft. in dolomitic limestone. The test recovered only water. It has not been decided how deep drilling will be carried.

The first wildcat, drilled by the same rig, was completed dry at 11,500 ft. in anhydrite stringers after failing to reach the Upper Cretaceous. This well, abandoned over a year ago near Logreno further to the north, was located on what was determined to be a false structure in the Milagro basin, a large basin in a chain of mountains running east-west and lying to the south of the Pyrenees. No shows were found in this well.

Participants . . . The group of American oil firms in the Spanish venture is led by General American Oil Co. of Texas, Dallas. Other participants are: DeGol-

yer & MacNaughton, Delhi Oil Corp., the Caltex group, and several individuals.

Whether or not the current test develops production, the group plans further drilling in Spain. DeGolyer & MacNaughton, a leading American oil and gas consulting firm, now has an exploratory crew at work in the country.

Brazil Looking Liberal

Sentiment favoring the entry of foreign oil capital appears to be developing in Brazil.

A recommendation that the country be opened up to foreign operators has been made to the government by the influential Federation of Commercial Associations.

The association approved a resolution at a round-table meeting in Rio de Janeiro calling on the government to modify existing petroleum legislation. Under the resolution, private capital, both foreign and Brazilian, would be permitted to participate in oil development, but half of all oil lands would be reserved to the state.

All exploration and production in Brazil is now carried on by agencies of the government. The effect of legislation existing since the '30s has been to keep foreign operators out. Last year, the Brazilian Congress placed the entire oil industry, except for importing and marketing, under a newly created government corporation, Petrobras.

The recent death of President Getulio Vargas may cause a change in Brazilian oil policy. The Vargas administration sponsored the original Petrobras law and strongly supported the national monopoly.

Bolivia Surveys Pipelines

The Williams Brothers organization has undertaken a survey of a proposed Cochabamba-Oruro-La Paz pipeline under contract with the Bolivian Government entity, Yacimientos Petroliferos Fiscales Bolivianos.

The system under study also includes a branch line to the Pacific Coast. The lines will be used to improve products movement in the country, as well as for export purposes. The cost of the Williams Brothers survey is $250,000.

Another development in Bolivia is the plan of Y.P.F.B. to begin soon the construction of a pipeline from Camiri field to Yacuiba on the Argentine border. This line is being built as the result of a commercial agreement between Bolivia and Argentina and will transport crude.

Guiana Search Slated

McBride forms company to explore coastal region

McBRIDE OIL & GAS CORP. has registered a new operating company in British Guiana and announced it expects to get under way with full-fledged exploratory work shortly after the first of the year.

The area of initial activity will be in the vicinity of Courantyne in Berbice County where the sedimentary section is believed to reach to a depth of 7,200 ft. Courantyne is at the southeastern end of the British Guiana coast adjoining Surinam, or Dutch Guiana. McBride already has a seismograph picture of the area between the Berbice and Courantyne rivers.

McBride's concession comprises an area of 3,275 sq. miles and includes the offshore coastal section up to the 3-mile territorial limit. The company has proposed construction of a small refinery of about 3,500 bbl. daily capacity to operate on imported crude oil initially. However, this project is in abeyance pending further progress on the exploratory undertaking.

George J. Greene is in charge of the British Guiana program as foreign manager of the company. The new operating company which has been registered in Georgetown, the capital, is McBride Oil & Gas Corp. of British Guiana, Ltd. Its directors are Henry L. McBride, R. B. Lee, Charles S. Faulkner, Paul B. Wittman, Richard H. Parker, Samuel Smith, Milton T. Gregory, William J. Raatgever, Eugene F. Correia, Rahman B. Gajraj, David A. Blackman, George Willock, Reginald Allan Humphrey, and Jack N. Hamilton-Bayley.

There has been intermittent interest in British Guiana's oil possibilities for many years. More recent work has indicated possibly better prospects to be toward the southeast with only thin sediments in the northwest near Venezuela. The last company to do work in Brittish Guiana was Panhandle Oil Corp. which abandoned its exploratory concession in the northwest after preliminary geological studies. An unsuccessful well was drilled in British Guiana in 1944 by Trinidad Leaseholds, Ltd., and later by the Standard Oil Co. (N. J.) organization in adjoining Dutch Guiana.

World Briefs

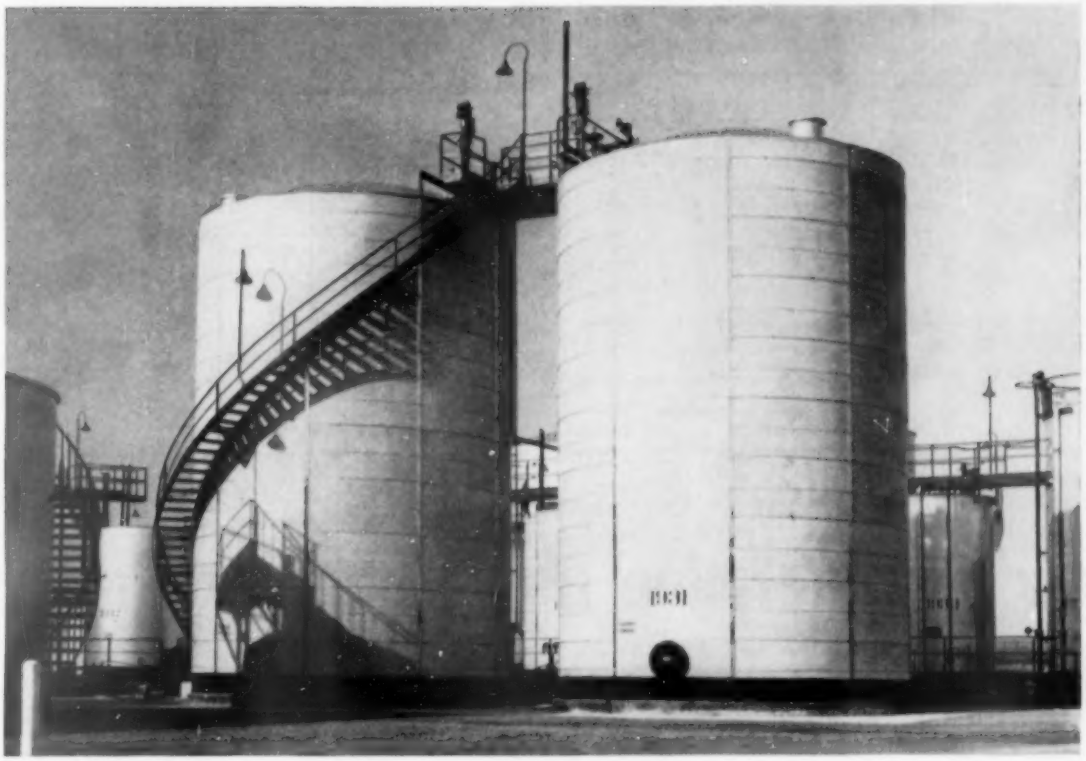
A gas discovery in northera Italy between Cremona and Mantua around Castellucchio has been announced by the Italian Government organization, Ente Nazionale Idrocarburi. Details on the development were not given. E.N.I. has also announced that it will begin delivery of natural gas to industries in Genoa by the end of this year. A new gas line from the Cortemaggiore area to Genoa is scheduled to be completed by the end of November.

Husky Oil Co. and the New York investment firm, Bear, Stearns & Co. have organized a new company, Israel-American Oil Corp., to carry out the companies' activities in Israel. The work formerly was handled by Husky International, Ltd., owned by the same two firms.

The Swedish refining company, Koppartrans Oljeaktiebolag, has announced plans for the construction of a 3,000-bbl. daily capacity catformer at its Skarvik, Sweden, refinery under license from The Atlantic Refining Co. The Skarvik refinery has a crude-oil capacity of about 24,000 bbl. daily.

Pakistan Petroleum, Ltd. (Burmah Oil Co., Ltd.) has suspended its deep wildcat test at Zin, in the Bugti tribal territory of Baluchistan, West Pakistan. The company said the well found porous limestone below the level of the gas-bearing limestone discovered at Sui but test showed only a small amount of gas at low pressure. The company has completed seismograph work and has a 40-mile road under construction to test another structure 33 miles to the south of Sui field at Uoh. Drilling at the Zin location was started in July 1953 following construction of a 55-mile road from Sui.

if CORROSION is the problem . . .



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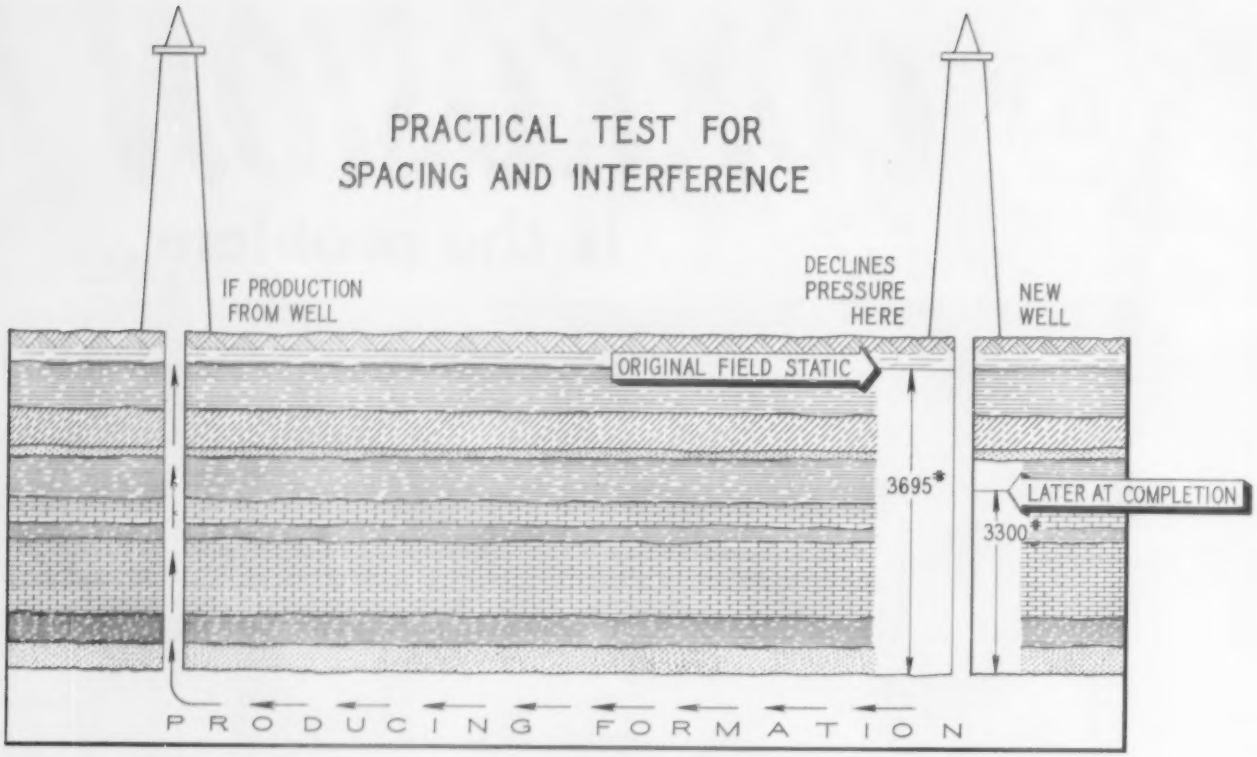


Engineering Study Points Out . . .

How to Determine Most Efficient Pattern Of Well Spacing For a Field

by C. H. Keplinger

THIS is a summary of an engineering study of the Madison lime reservoir, Tioga field, North Dakota, to determine the most efficient pattern of well spacing for the field. Based on performance of the field from its discovery on April 15, 1952, to date—which includes a large amount of reservoir pressure and interference data between the presently producing wells in the field—it is concluded that the Madison lime producing reservoir is continuous and interconnected within the confines of the pool. Because of the established interference between wells from bottom-hole-pressure studies, and the known continuity of the producing horizon as a common source of supply, an 80-acre spacing pattern is recommended for the field because:

1. One well to an 80-acre drilling unit will efficiently and adequately recover the oil from Tioga field.

2. There will be no increase in oil recovery per acre by drilling the field to a greater density than 1 well per 80 acres. The engineering evidence shows that the development of the field on an 80-acre pattern will produce as much oil per acre as if the field were drilled on a 40-acre pattern.

3. Greatest ultimate recovery of oil from the field under modern producing practices will be realized by maintenance of reservoir pressure and by producing the field at optimum producing rate or MER (maximum efficient rate of production). This rate is determined from performance of the field, and is not related to the number of wells or well spacing. It would be impossible to increase the optimum daily rate of production of oil from Tioga field by changing the drilling pattern from 80 to 40-acre spacing. The same monthly royalty income to the royalty owner and the same monthly oil-production income to the operator can be maintained on 80-acre spacing as on 40-acre spacing.

4. Experience of the oil-producing industry has established that 80-acre spacing is adequate to drain efficiently an interconnected reservoir producing from the same common source of supply such as exists in the Madison lime in Tioga field.

Author is with Keplinger & Wanenmacher, petroleum engineers, Tulsa.

Tioga Field Data—Madison Lime

Development of the Madison lime reservoir, Tioga field, in Williams, Mountrail, and Burke counties, North Dakota, has proceeded on an 80-acre spacing pattern. Wells are currently being completed at a rate of three per month. A total of 124 wells were completed as of May 1, 1954, and with the

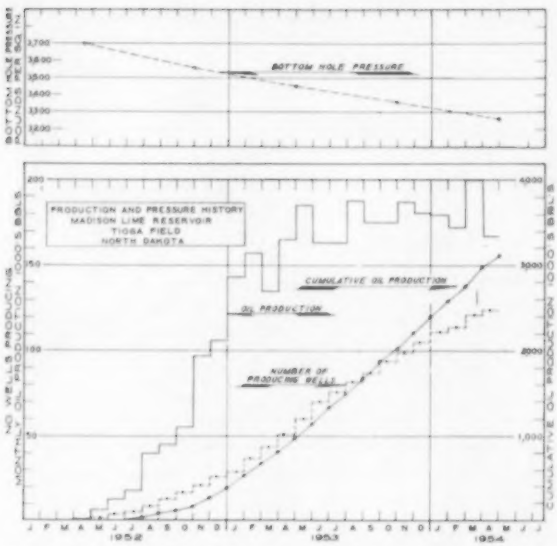


Fig. 1—Tioga's Madison lime wells (8,300-8,400 ft.) total 125. Bottom-hole pressure has declined from 3,695 to 3,260 psi.

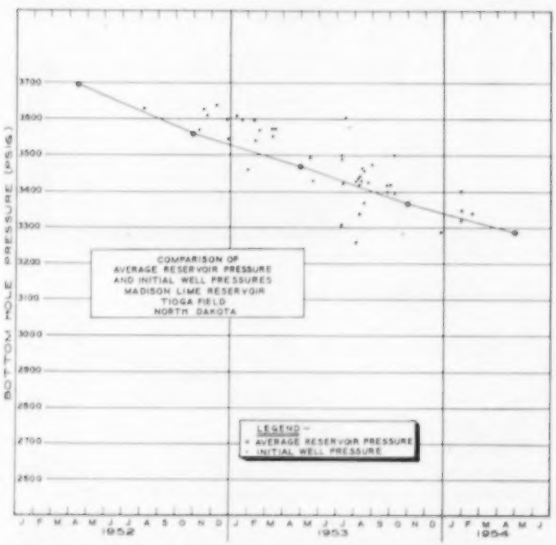
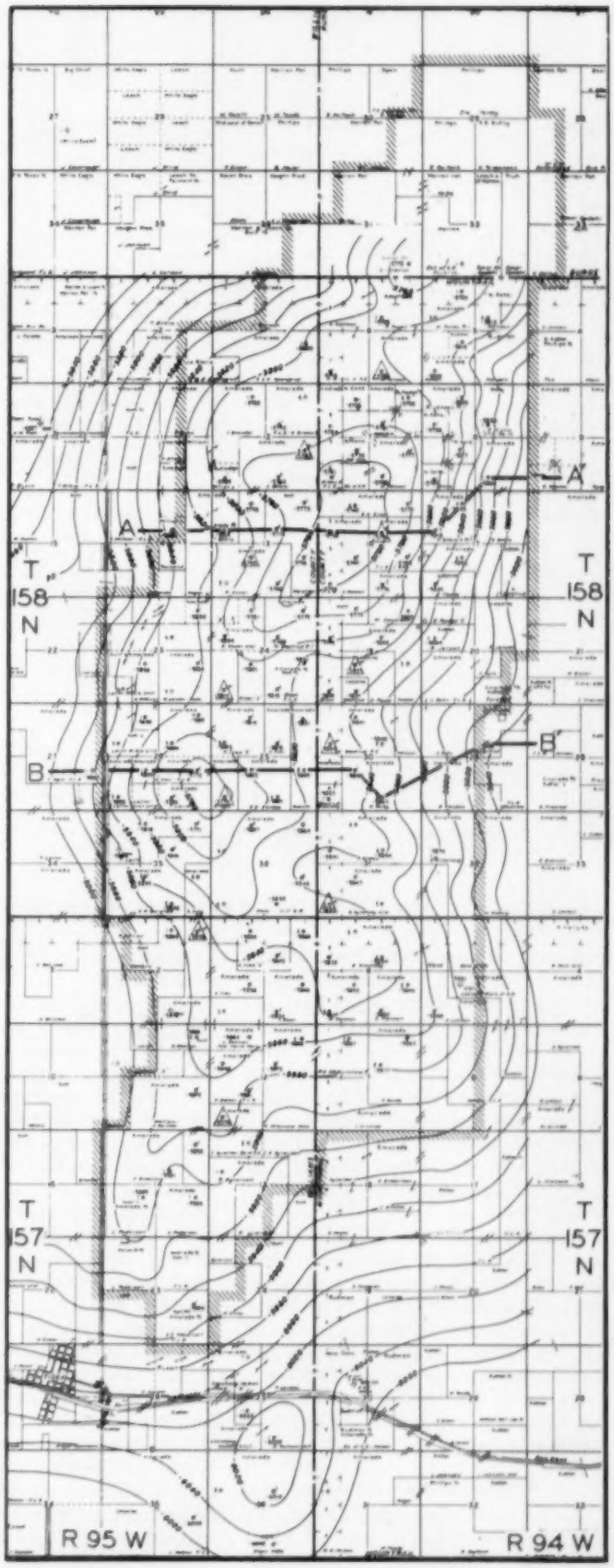


Fig. 2—The curve connects the average reservoir pressure for all wells, at different survey periods. Dots represent initial well pressures for new completions.

"The natural factors that have important influence on ultimate recovery of oil from a reservoir are kind of rock, character of porosity, type of structure, extent of faulting and fracturing, structural relief, producing thickness, type of drive, permeability, viscosity, connate water, gas-oil and water-oil ratios, and reservoir pressure."



TIOGA STRUCTURE MAP. Contoured on top "main porosity," Madison lime reservoir. Contour interval 20 ft. Triangles indicate cored wells.

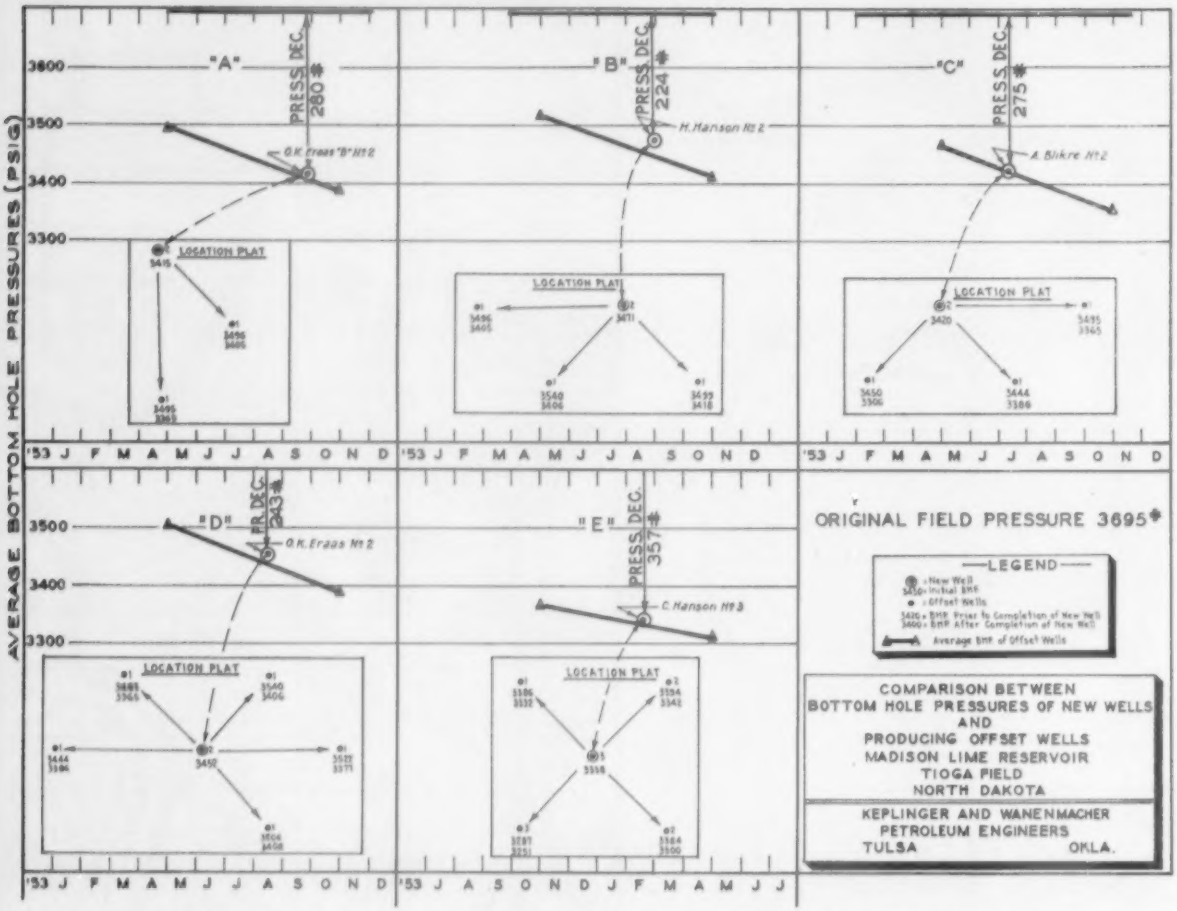


Fig. 3—Comparison of bottom-hole pressures and their offsets, for lease locations A-E, inclusive.

exception of three wells, all produce by flowing. Cumulative oil production to May 1, 1954, is 3,123,224 bbl., and during April 1954, the field produced 167,769 bbl. of oil.

Total Tioga field area is 20,960 acres. Development on the 80-acre spacing pattern has been with wells in the northeast and southwest corners of each quarter section. There are only four so-called "off pattern" wells in the entire field.

Discovery well was Amerada Petroleum Co.'s 1 H. O. Bakken, SW NW 12-157n-94w, in the Madison limestone. The well flowed through casing perforations 8,312-8,350 ft. at a rate of 217 bbl. per day through 12/64-in. surface choke. Initial gas-oil ratio was 1,094 cu. ft. per bbl. Top of the main pay in Madison lime was 8,306 ft., or 5,848 ft. subsea.

Problem of Well Spacing

Before presenting the engineering data and interference data of Tioga field which substantiate that the pool should be developed on an 80-acre pattern, the problem of well-spacing and its historical development will be briefly reviewed.

During early development of the oil industry, wells were drilled on a rather dense spacing program. As more information became available, it was found that ultimate recovery in a continuous reservoir was independent of well spacing. It was a slow development before this conclusion was reached. From a practical standpoint, pools which were drilled on wider spacing indicated the same recovery as pools drilled on closer spacing. From the theoretical standpoint, reservoir-mechanics engineering indicated that recoverable oil was independent of spacing. After the advent of the bottom-hole pressure gage, interference and intercommunication between wells on spacing patterns of greater than 160 acres was proved.

The leading petroleum technologists in the oil industry are in agreement that recoverable oil from a reservoir under efficient operation conditions is independent of the spacing, which means in practical terms for Tioga field that development of production of Tioga on 80-acre spacing will recover as much oil per acre as if the field were developed on 40-acre spacing.

The Interstate Oil Compact Commission, a voluntary organization of oil and gas-producing states dedicated to the conservation of oil and gas, has made comprehensive studies of well spacing, and has reviewed the great amount of well-spacing information prepared by outstanding petroleum engineers. Its research and coordinating committee has issued the following pertinent paragraphs on well spacing (I.O.C.C. Quarterly Bulletin, Vol. X, No. 2):

In gas-expansion reservoirs, the original energy potential of the gas is normally much greater than that needed to move oil to wells through great horizontal distances and to raise the oil produced in the early life of a pool to the surface after it reaches well bores.

Energy available for moving oil to wells in water-drive fields is limited only by time and is not qualified by distance of horizontal movement.

In fields with gas-expansion and water-drive energy, production should be controlled to make maximum use of water-drive energy and to hold as much original solution gas as possible in the oil until the oil reaches the vicinities of well bores.

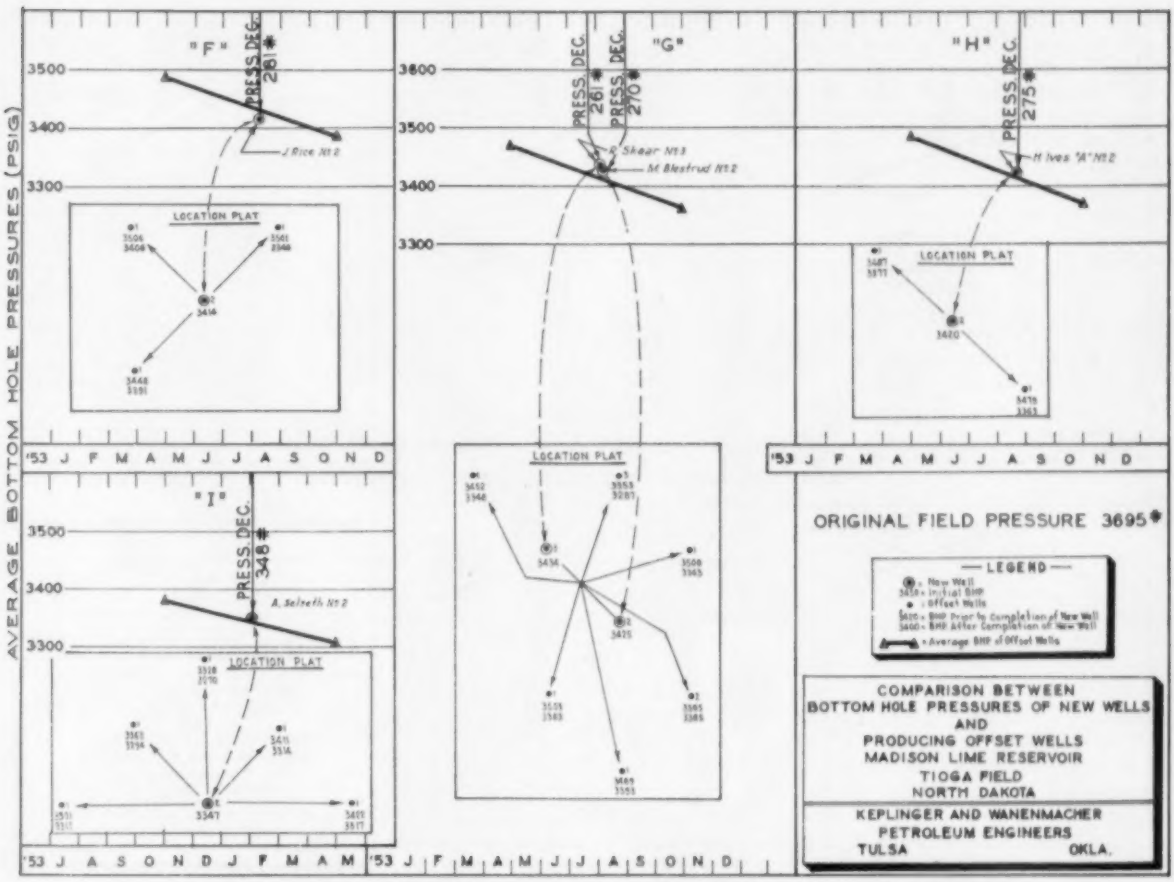


Fig. 4—Comparison of bottom-hole pressures and their offsets, for lease locations F-I, inclusive.

Both gas-cap drive and gravity drainage may become important factors in moving oil to well bores.

In either solution-gas, water-drive, or combination-drive reservoirs, the production of oil is independent, within reasonable limits, of well density.

Assuming the same efficiency in other features of reservoir development and control, the greater the well density the shorter may be the time in years required to produce all the recoverable oil from a reservoir. This should be qualified on two counts:

1. The total oil required from a field to fill market demand might be produced as efficiently from fewer widely spaced as from many closely spaced ones.
2. The total oil that could be produced from a reservoir without physical waste might be as efficiently produced from fewer widely spaced as from many closely spaced wells.

Efficient reservoir control to secure maximum benefit of driving energy is the principal factor in securing maximum oil recovery from a reservoir. Unitization of development and operation is one of the most important ways of accomplishing efficient control.

Well spacing should be chosen to fit structural and reservoir fluid characteristics, peculiarities, and irregularities, and not in accordance with some regular geometric pattern. In full application, this would necessarily involve unitization.

Economic considerations and those of expediency must necessarily have an important influence in determining well density. Overall decisions should be made by geologists, engineers, and economists.

Where land-lease controls permit, new oil fields could be first developed on wide spacing patterns. Final well density and other development and production practices could then be determined in the light of geological, engineering, and economic information developed.

Concepts of primary and secondary recovery should be merged to consider the two stages of production as one, the continuing primary state.

The natural factors that have important influence on ultimate recovery of oil from a reservoir are kind of rock, character of porosity, type of structure, extent of faulting and fracturing, structural relief, producing thickness, type of drive, permeability, viscosity, connate water, gas-oil and water-oil ratios, and reservoir pressure."

Trend in Well Spacing

The trend in other states is toward wide spacing. Both the oil producer and the regulatory bodies of the respective states are learning that the proper operation of a field is far more important than the number of wells. Even in states that do not have conservation laws which embrace spacing regulations, the trend is toward wide spacing. Table 1 lists the oil fields in Louisiana with proration units of 80 acres. There are 16 pools in this tabulation. It is interesting to note that the date of the first order for the Haynesville Pettit formation was in 1942. The Louisiana Commission of Conservation in its findings, after considering all the evidence at public hearings, has stated many times that one well can reasonably be expected to drain efficiently and economically an area of 80 acres, and that the 80-acre spacing pattern affords each owner the opportunity to recover his fair share of the reservoir oil.

Table 2 is a schedule showing a large number of Texas oil fields with proration units of 80 acres or larger which are operating under orders of the Texas Railroad Commission. Evidence submitted to the Railroad Commission at various hearings has indicated interference in continuous reservoirs on spacing patterns which would be equivalent to more than 160 acres. Wells completed late in the life of pools have had bottom-hole pressures equal to the surrounding wells. Because of the low pressure of the new completions in comparison to the initial reservoir pressure of the pool, it is obvious that there has been interference and that drilling of the new wells must be considered unnecessary.

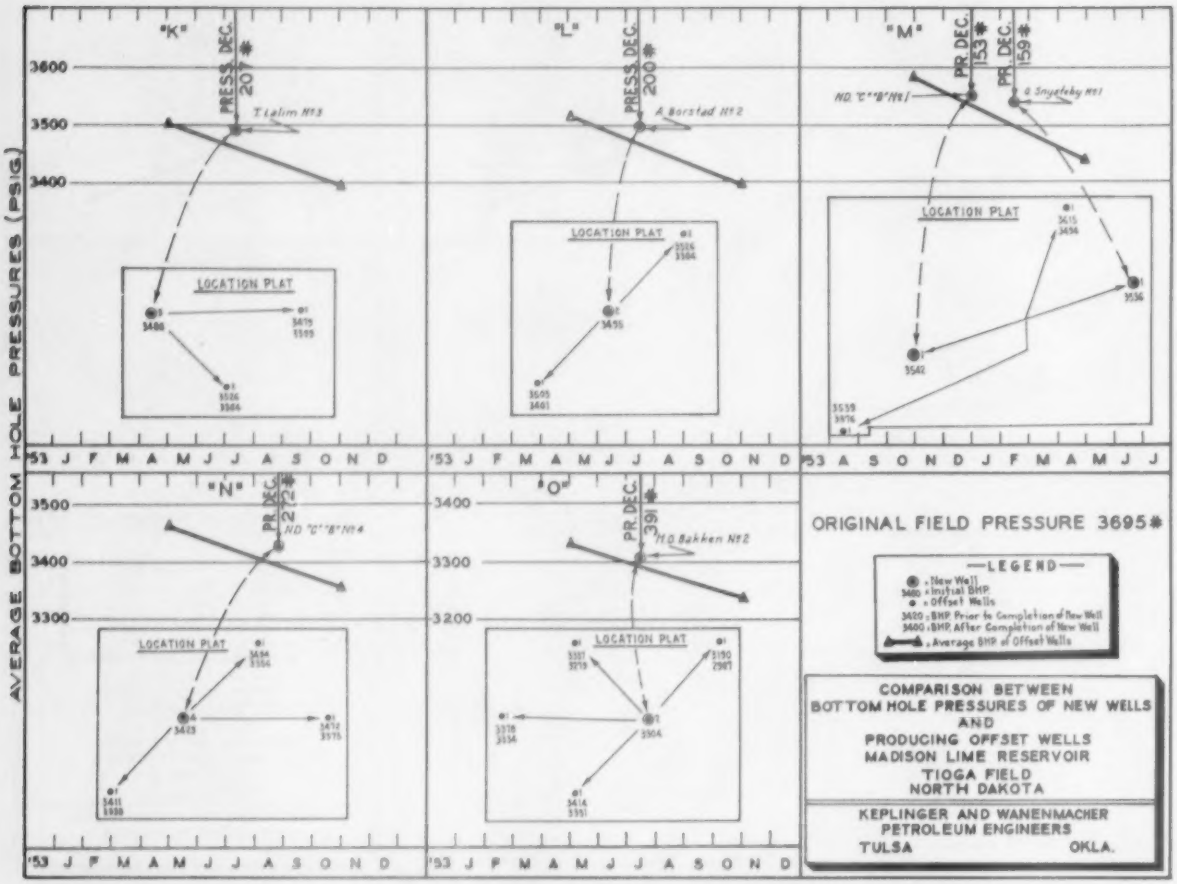


Fig. 5--Comparison of bottom-hole pressures and their offsets, for lease locations K-O, inclusive.

In New Mexico, there are four fields operated on 80-acre spacing, namely: Fowler pool, producing from the Ellenburger limestone; Bagley pool, Knowles; and Hightower. These pools are under orders of the New Mexico Conservation Commission. There is, in addition, one other pool, South Warren McKee, which is being operated on 80-acre spacing by Continental Oil Co. without an order of the commission.

In Oklahoma there are four oil fields with proration units of 80 acres, namely: Northeast Bradley, Freeney, North Lindsay, and Northwest Lindsay. The first order for 80-acre spacing in Oklahoma was issued on April 26, 1949, for Northeast Bradley field.

In Wyoming several pools are on voluntary 80-acre spacing, including Sage Springs Creek and two Madison lime pools in the Oregon basin. Both Beaver Creek pool and Elk Basin Madison reservoirs are on 160-acre units.

In Utah, Roosevelt field is being developed on 320-acre spacing. In addition to these examples of pools in the United States, reservoirs are being produced in the Middle East oil fields of Iran, Iraq, and Saudi Arabia with spacings at times up to 2,500 acres or more per well. Several of these pools have what have been termed observational wells, to determine the efficiency of production throughout the reservoir. It is the judgment of these operators to date that the reservoirs are being efficiently operated with these wide-spacing patterns. Also, several oil fields in South America are on wide spacing. A nearby example in Canada is the Sturgeon Lake area, which is being developed on 80-acre spacing in Alberta.

Tioga's Madison Lime Engineering Data

The basic engineering evidence which substantiates 80-acre spacing for Tioga field is the pressure information from the inception of the field to the present time, and the gas-oil-ratio data. The pressure data show interference throughout the complete length of the field, and the gas-oil ratios have remained equal for both the old wells and the new ones, which have been completed. This is indicative of intercommunication throughout the entire reservoir. If the reservoir was not a continuous common source of supply and was not interconnected, the gas-oil ratios of the original wells would have increased. The crude oil production and the bottom-hole-pressure history are given in Fig. 1.

Fig. 2 is a comparison of average reservoir pressure by periods with the initial well pressures. From these data, it is evident that the new wells come in with pressures comparable to the field average. This is further evidence that interference is affecting the entire field with the present plan of development, and that all segments of the reservoir throughout the entire length from north to south are being adequately and efficiently drained.

In order to show graphically the well interference results at Tioga, schematic diagrams have been prepared which illustrate a practical test for well spacing and interference. The diagrams usually depict two wells. On the left is an old producing well. On the right is a new well. The test for interference and spacing is that if production from the well on the left causes a decline in the pressure of the new well, there is interference. With a spacing of 80 acres which has been used in Tioga field, this is concrete evidence that the 80-acre pattern is adequate to drain efficiently Tioga field.

TABLE 1—LOUISIANA OIL FIELDS WITH PRORATION UNITS OF 80 ACRES

Field and reservoir—	Order No.	Effective date	Unit size (acres)	Depth (ft.)	Total spaced acreage
Athens, Hosston	48	1- 5-43	80	6,200	10,800
Athens, Pettit	48-A	2-12-46	80	5,900	3,200
North Carterville, Pettit	74	12-23-43	80	6,100	5,100
Dykesville, Pettit	204	12-19-50	80	5,700	3,800
Haynesville, Pettit	35	2- 9-42	80	5,300	16,500
Haynesville, Taylor	35-E	3- 5-45	80	8,900	16,500
Haynesville, Smackover A & B	35-F	4-14-47	80	10,100	16,500
East Haynesville, Birdsong-Owens	105-A	3-13-46	80	5,200	5,000
East Haynesville, Gloyd	105-D	12- 6-51	80	4,500	5,000
Hico-Knowles, Woodruff	137-B	7-19-51	80	4,900	10,000
Iowa, FY-1			80	11,000	800
Mamou, Deshotels	133	5- 1-47	80	11,500	4,500
Saline Lake, Wilcox	152	10- 7-48	80	5,300	1,900
Shongaloo, Rosebury	165-A	7-11-50	80	9,200	2,000
North Shongaloo, Pettit	104	8- 6-45	80	5,700	2,100
Shreveport, Pettit	13-E*	9-22-49	80	5,550	160

*Rescinded Order No. 13 (March 1, 1949) which provided for 40-acre spacing.

TABLE 2—TEXAS OIL FIELDS WITH PRORATION UNITS OF 80 ACRES AND LARGER

Field and reservoir—	Date of order	Unit size (acres)	Depth (ft.)	No. wells
Bammel	8- 1-40	*40	6,300	3
Chocolate, Bayou, Upper Frio	5-15-41	*40	8,700	28
Chocolate Bayou, Houston Farms	5-15-41	*40	9,600	17
Chocolate Bayou, Alibel	5-15-41	*40	9,000	17
Gillock, South; Big Gas Sand	4-18-49	*40	9,000	64
Old Ocean, Armstrong	9- 1-49	*40	10,000	98
Old Ocean, Chenault	9- 1-49	*40	9,600	15
Old Ocean, Larsen	9- 1-49	*40	10,800	3
Red Fish Bay, Zone 5-A	12- 3-51	80	7,900	15
Red Fish Bay, Zone 5-B	12- 3-51	80	8,000	34
Red Fish Bay, Zone 14	12- 3-51	80	8,200	9
Blackfoot; Rodessa, Pettit, and Travis Peak	5- 2-49	*40	9,000	10
Navarro Crossing	6- 9-39	*40	5,900	7
Claytonville, Canyon Lime	8- 4-53	80	5,700	34
Benedum, Spraberry	8- 1-53	†80	6,700	148
Fort Chadbourne, Odom Lime	3-23-53	*40	5,500	304
Pegasus, Ellenburger	7-23-51	80	12,800	92
Pegasus, Pennsylvanian	12- 3-51	80	10,300	54
Embar, Ellenburger	12- 1-42	80	7,800	24
Parks, Pennsylvanian	6-25-51	80	10,440	46
Salt Creek, Pennsylvanian Reef		‡80	6,200	§108
Spraberry	9-22-52	†80	7,500	1,247
Statex, Cisco Reef	8-18-53	80	10,000	13
Wheeler, Ellenburger	11- 1-44	80	10,700	34

*80 optional. †160 optional. ‡Maximum 90. §Field-wide unit.

TABLE 3—ALBERTA, CANADA, SPACING ORDERS OF 80 ACRES OR MORE

Field—	Date of order	Unit size (acres)	Producing zone	Depth (ft.)
Golden Spike	2- 6-52	160	D-3 ls.	5,627
Pembina	5-20-54	80	Cardium sd.	4,600
Rimbey	7- 2-53	160	D-3 ls.	7,800
Stettler	6-24-54	40 and 80	D-3 ls.	5,320
Sturgeon	1-19-54	80	D-3 ls.	8,739
West Drumheller	10- 8-53	40 and 80	D-2 ls.	5,536
Westerose	1-13-54	80	D-3 ls.	7,190

On the diagram, the pressure effects are indicated on the new well. The original-field static pressure is shown to be 3,695 psi. The bottom-hole pressure at the time of completion of the new well is indicated to be 3,300 psi., so that there has been a drop in pressure of the new well from the original static-pressure conditions of 3,695 psi. With this interference type of testing in mind, a series of pressure charts were prepared which have been plotted against time for wells throughout Tioga field. (See Figs. 3, 4, and 5.)

The bottom-hole pressure data on the 3 C. Hanson well ("E" in Fig. 3) are very interesting because it is a center 80-acre location between four producing wells. Initial pressure of this well was 3,338 psi., very close to the average for the area. In this situation, it is indicative and quite obvious that 3 C. Hanson was an unnecessary well, and that the other wells which would be on a spacing comparable to 160 acres are causing interference around the area of the 3 C. Hanson.

Fig. 4 is a comparison between bottom-hole pressures and producing offset wells for producing areas F and I, inclusive. For Fig. 5, the most interesting evidence of wide interference is in the G area, and includes the wells 3 R. Skaar and 2 M. Blestrud. These are two 80-acre-spaced wells which were completed in between seven 80-acre-spaced wells. The average bottom-hole pressure of these interspaced wells is comparable to the average pressure of the area, and indicates interference effects in excess of 160-acre spacing. It is also interesting to note that the average pressure of these new completions, 3 R. Skaar and 2 M. Blestrud, is approximately 265 psi. below the initial static pressure of the field of 3,695 psi.

Fig. 5 shows the comparison between bottom-hole pressures of new wells and producing offset wells. All of these graphs show that interwell reservoir-pressure communication in Tioga pool greatly exceeds 80 acres per well. The graph O in Fig. 5 includes the discovery well 1 H. O. Bakken as one of the producing offset wells. The offset 2 H. O. Bakken was completed in June 1953. The average pressure of this well, compared to four offsets, shows equalization of pressure. In addition, the pressure of this well is some 391 psi. lower than the original field static pressure of the area at the time the 1 H. O. Bakken opened the field.

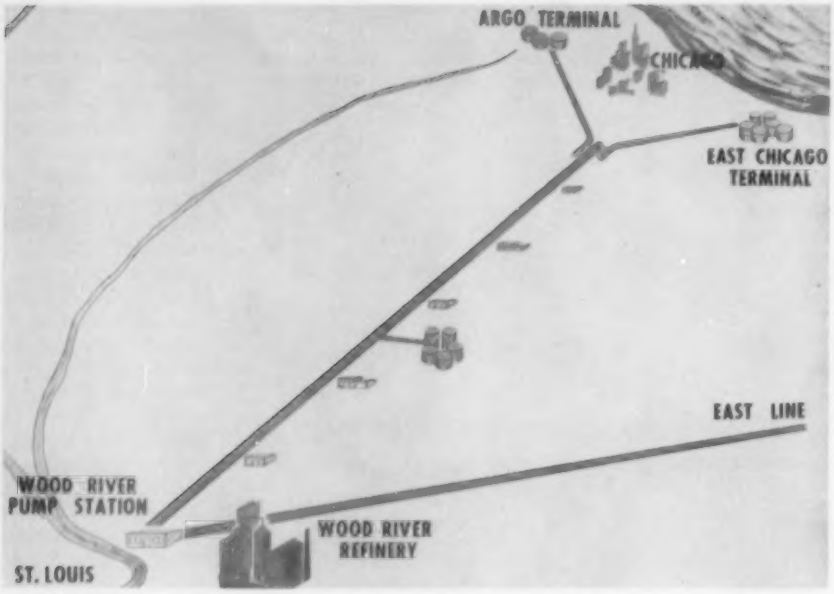
BOOKS

PRACTICAL PIPING FLEXIBILITY DESIGN AND FLOW. By W. A. Thomas, Published by the author, 2742 Philadelphia Ave., Pittsburgh 16. 199 pp., $25.

Engineers responsible for analysis of thermal stress and reactions in piping systems will find this book a great time saver in calculating proper piping specifications. The author, a Pittsburgh consulting engineer, has reduced the normal analytical procedures to a simple and practical method of approximation which includes safety margins. This method offers a quick and workable check that covers worst conditions as well as the unpredictable deviation of manufacture, erection, and operation. Heavily illustrated with graphs and charts, the book is prepared in ring-binder style to permit addition of new pages as they are published in future years.

THE ROTARY-DRILLING CONTRACTING INDUSTRY IN THE MID-CONTINENT AREA AND RELATED BANK FINANCING. By Earl L. Beard, Jr., National Bank of Tulsa, Tulsa. 135 pages. $3.75.

The author has performed a definite service to the drilling and banking people by writing this book. In it, he has outlined the problems facing both the contractor and the banker in considering loans. The many model contract forms and agreements will prove particularly helpful. From the information available, both the contract drillers and the bankers can consider loans with much more insight into each other's problems. This book is of value and interest to a wide audience in the petroleum industry since much of the information is presented in nontechnical language and with helpful illustrations.



AUTOMATIC STREAM BLENDING of gasolines is performed at the Wood River terminal of Shell's products lines which extend to the Chicago area and to Lima, Ohio.

Something new in pipeline techniques

Products Automatically Blended in Line

A radical, significant step has been made by Shell Oil Co. in using a section of pipeline for automatic blending of various components into finished gasoline. Instead of going into conventional refinery blending tanks, the components go through automatic proportioning equipment directly into a line. A mechanical brain governs the process and provides a running check on the blending accuracy.

by Paul Reed and R. G. Deering

AN automatic process for pipeline blending of components into finished gasoline, now in use in connection with Shell Oil Co.'s Wood River, Ill., terminal facilities, is an advanced step in products pipelining. Compared with present practices of using blending tanks, the technique exhibits many outstanding advantages.

In the blending operation, product components are taken directly from refinery stock tanks, fed through automatic, preset proportioning devices, and into Shell's North or East products lines which extend to Chicago and to Lima, Ohio, respectively. The entire process is controlled by complex electrical, mechanical, and hydraulic equipment items which characterize so many automatic systems. However, the incorporation of a great number of fail-safe and check-back devices make erroneous operation almost impossible. Standby meters, calibrated sections of pipeline for checking each component meter, and a feed-back system which compares desired with actual blend make the entire operation one of accuracy and dependability.

Numerous advantages . . . Perhaps the most readily seen advantage is the elimination of the human element and its replacement with very accurate and closely controlled meters, gages, controllers, and computers. From an operational standpoint, this is immediately reflected in considerable saving in time and labor in setting up for delivery of any given type gasoline. Also, it enables delivery of products which are consistently uniform in make up and which are accurate in desired blend to within a few one hundredths of a per cent of original specification.

While not so apparent, the system also gives greater flexibility in that short-notice changes in product specifications can be handled more readily. Also, since the additions of TEL, dyes, and blend stocks are controlled remotely, the entire mixing operation can be performed with more safety.

Other advantages are the elimination of tankage where blending formerly took place, the prevention of vapor loss which formerly occurred in blending, and the probability of having greater agitation and more thorough mixing.

For operation of the Wood River-Chicago products pipeline, Shell Oil Co.

collaborated with Proportioneers, Inc., for the development of equipment for blending eight components in the line. During the period that it has been functioning at Wood River, the accuracy of this type of blending has proved to be more advantageous than results obtained by conventional tank blending.

The gasoline delivered to the pipeline moves continuously from the individual base stock lines in the refinery, through an automatic stream blender.

Other products shipped . . . The full range of shipments through the north line, including gasoline and other refined products, is as follows:

Eight grades of premium and house-brand motor gasolines.

Four commercial and fighting grades of aviation gasoline.

Liquefied petroleum gas for domestic and industrial use.

Military jet fuels for the Air Force.

Kerosine for lamps and other uses.

Distillate fuels for heating.

Heavy fuels used in commerce.

Diesel fuels for engines and trucks.

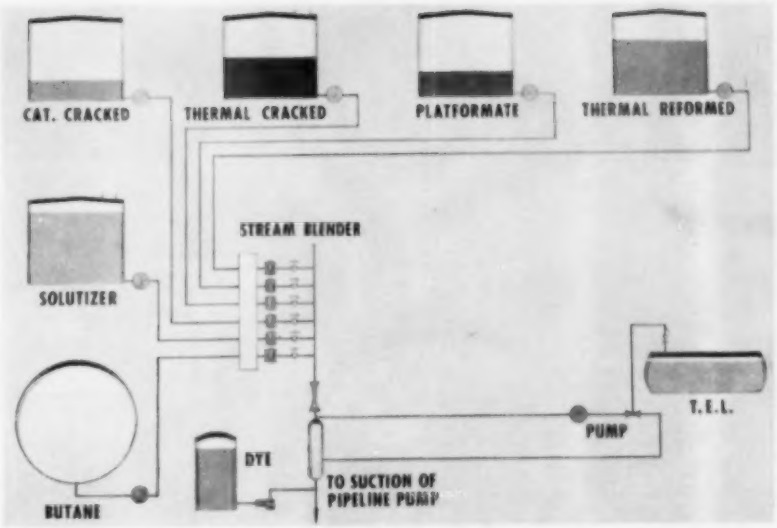
Naphthas for cleaners and diluents.

Special solvents for paints, plastics, etc.

East Chicago terminal is the major receiving station.

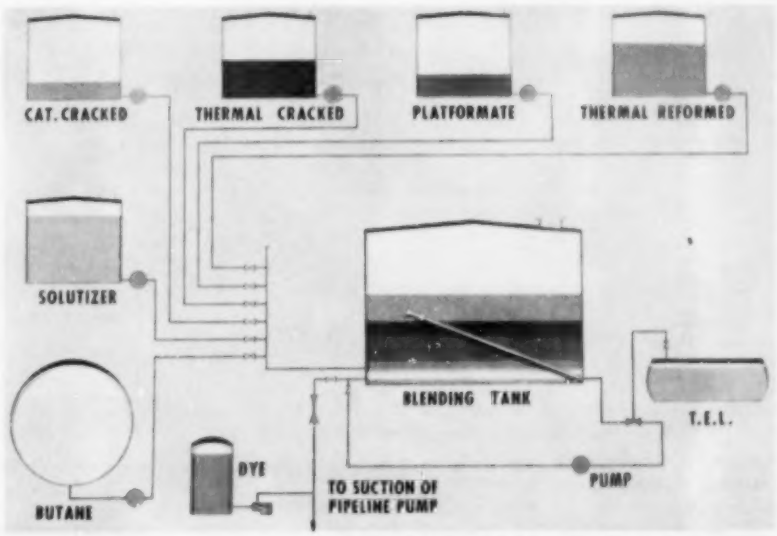
The North line not only serves East Chicago, but also delivers product to the Argo terminal and the Harristown terminal with pump stations located at Bradley, Sibley, DeWitt, Auburn, Barnett, and Wood River, which give the line a capacity of 100,000 bbl. per day. Wood River pumping station is the originating point for two lines: the North line to Chicago, and the East line, which extends to Lima, Ohio.

These lines are served by the Wood River refinery and the gasoline blending for both lines is accomplished through continuous, automatic-stream blenders. Methods of blending, measurement, and product separation for North line movements are described in this article.



THE NEW . . . Stream blending

In stream blending the components are pulled from tanks, go through the blending section, have dye and lead added, and are pumped into the line.



THE OLD . . . Batch blending

Batch blending, the old method, called for separate blending tanks where jets were used to mix components.

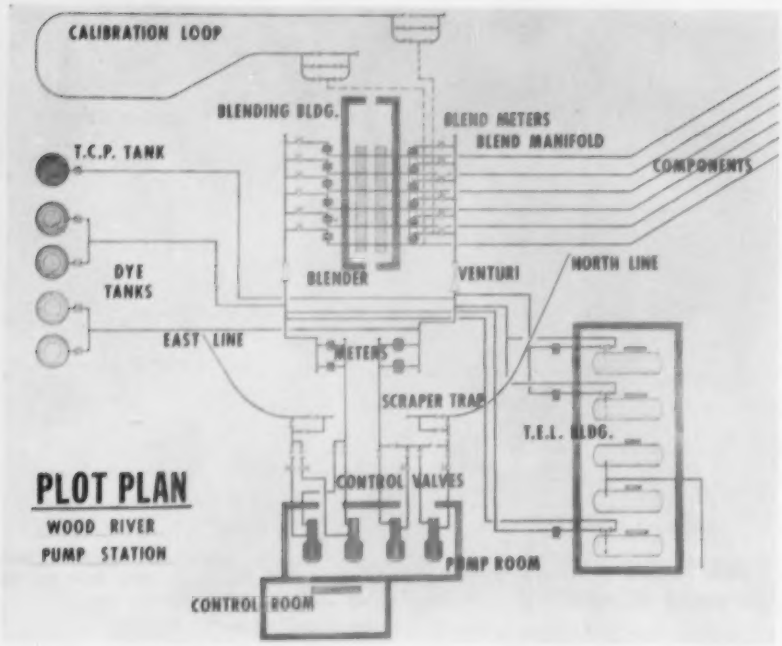
Old vs. new . . . The prevailing practice in blending gasolines is to transfer measured quantities of successive components into a mixing tank, agitate, test for volatility and lead requirement in the laboratory, and then add tetraethyl lead. Following the addition of lead, some form of agitation is required to assure uniformity in the tank, top, middle, and bottom. The laboratory then makes the final test and if specifications have not been met, further adjustments must be made. The intank blending operation involves the refinery dispatching department which sets up the schedule of pumpovers from component rundown tanks to the blending tank. The gagers and pumpers then line up valves, handle the pumps, and gage the successive quantities. Following this the lead-plant operators add lead and recirculate for finished specifications of product.

In the new operation, which is believed to be unique in pipeline practice, all the components are blended simultaneously and go direct to the pipeline. This entirely eliminates the blending tank and provides a continuous rather than a batch process. This reduces the tankage required, the in-process stocks, and the time required for blending.

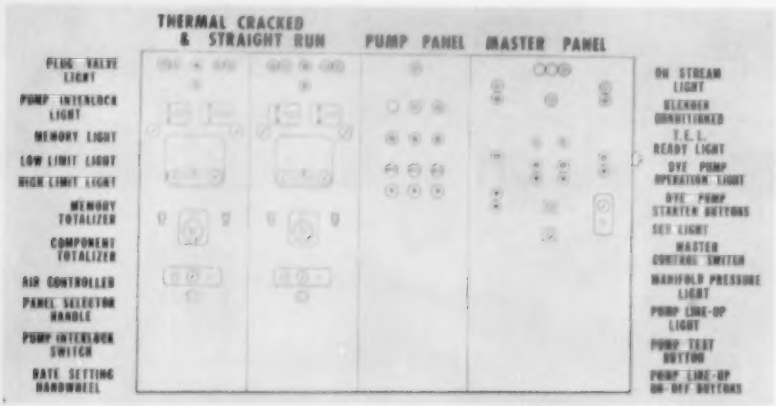
Process control . . . The central control room of the pump station has instrumentation and interlocks to supervise the blending and the pipeline operation.

A panel carries the layout of the collection system for all products, the push buttons which start and stop field booster pumps at the refinery tanks, the run lights for these pumps, and the push-button controls and signal lights governing the motor valves on the collection manifold which feed the station.

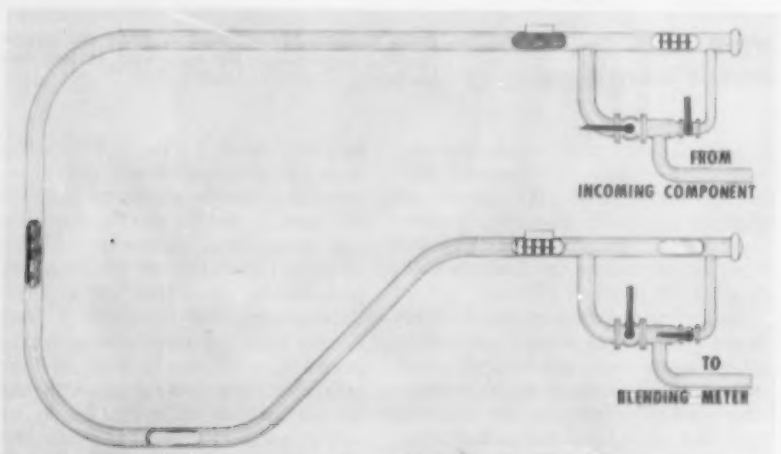
The pipeline pumps are controlled from the main console on and above which are all the usual controls for a pipeline pump station.



WOOD RIVER blending installation and main-line pump station.



CONTROL PANEL for thermal cracked and straightrun gasoline. Similar panels control other blending components.



CALIBRATION LOOP is manifolded to enable individual checking of all meters used in the blending process.

Pressures on incoming and outgoing lines are indicated by gages which provide necessary information for proper pump operation.

In the control room, operators handle all booster pumps which feed the component lines. These lines carry catalytic cracked, thermal cracked platformate, thermal reformed, solutizer, and butane streams which flow through the strainers and into the blender meters. In the blender building are control panels for the two blenders which serve the East and North lines. The mixed components pass out through the blend manifold and through the control venturi which regulates the loss-in-weight lead blenders, dye, inhibitor, and TCP injection. The stream then passes through the respective pipeline accounting meters into the pipeline pumps, out through the discharge scraper traps and on into the main line. This completes the gasoline flow diagram for the North line. The flow of East line gasoline is the same up to the blender, after which it goes through its blend manifold, into the lead venturi, and on through meters, pumps, scraper traps, and into the East line. The pumping equipment at the East line station consists of two units pumping in series at 900-psi. line pressure on any product.

Addition of lead . . . Proportioned gasoline components from the blender, containing only the base stocks, are mixed in the blend manifold and continue through a venturi meter. This metered differential pressure is converted by a Telechron driven cam in the Chronoflo transmitter to provide an electrical impulse whose length in a 15-second cycle is an accurate volume measurement. This electrical impulse operates the drive clutch in the TEL blender to proportion the addition of lead. This impulse also operates control valves on the metering pumps to add dye and corrosion inhibitor in proper proportions.

The same electrical sequence also proportions TCP and the collection of weighted average samples.

The loss-in-weight lead blenders were originally built and connected to the pipelines in 1944 and supplemented in 1953 to provide additional capacity required for the new 14-in. North line.

The Chronoflo signal from the venturi positively actuates the traveling poise in the automatic loss-in-weight blender. This poise drive continues to run whether or not lead leaves the tank. If lead does not flow the weigh beam rises and sets up monitoring signals in the lead building and main control room.

The lead blenders meet all of the requirements for safely handling lead

OVER-ALL VIEW of the installation showing dye, TCP, and inhibitor tanks at rear, blender building on right, pipeline pump room at left, and building for TEL blenders in foreground.

because they are closed systems operating under vacuum, and they operate at a constantly proportional rate, being calibrated to control directly in cc's of lead per gallon of gasoline throughout.

The dye tanks are large enough to hold mixes of several drums at once, so that dye can be directly educted from drums and mixed in the process. Thus, the occupational hazard of hand mixing dye in small lots is avoided. The addition of dye to the stream is done by a metering pump whose discharge is controlled from the Chronoflo. The TCP is added by the same sort of proportioning pump which, however, is controlled from the lead-blender poise drive to proportion the TCP as a function of the lead dosage. Again, since this product is handled in a closed system, no hazard is created.

Strainers and meters . . . There are six component lines which enter the pump station property from the southeast corner. Those six lines are connected in pairs and valved to horizontal strainers which are arranged in threes so that each line has an available spare strainer. Thus, strainer failure or clogging should never interrupt continuous operation of the blender.

These strainers are opened up through Unibolt flanges and the strainer elements are roller mounted on the back and so they can be rolled out on a dolly and quickly cleaned.

The cleaning is accomplished by a high-pressure water-hose stream and requires only a few minutes of only one operator's time. Again, there is small likelihood of stream failure due to strainer clogging.

From the strainers, each stream continues through its measurement meter in the blender feed system, joining the other components at the blend manifold.

For maximum flexibility in the use of stocks for blending, four of the component streams are measured by either of two different sized meters and two of the component streams are measured by single meters. Thus, there are actually four spare meters for component measurement and there is an emergency cross-over manifold which can feed and meter with any base stock. There should be no interruption of continuous operation caused by meter failure.

How blending is done . . . The stream blender and measurement practices associated with it, guaranteeing accuracy and permitting direct connection to the pipeline, are described as follows:

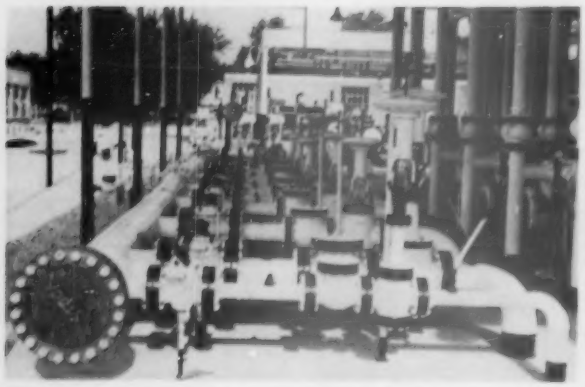
There are six sets of similar component panels. On each component panel there are supervisory lights, memory totalizer and component totalizer, air controller, panel selector switch, pump interlock switches, and master handwheel and indicator by which the percentage for each component stream is adjusted. To the right of each component panel is a switch panel which controls one or more field booster pumps supplying the component to the blender. On this panel are the pump lineup and test buttons with their indicating lights and master light showing manifold pressure.

The master panel is used to ready the gasoline blender for operation and to interlock the automatic starting of the lead blender, the dye, and the TCP metering pumps. The master control switch, which has three positions, is already on "set" and the "set" light is illuminated. After push button for the proper dye has been lined up as shown by its indicating light and the lead blender ready light is "on", the operator turns the master control switch to the "blender conditioned" position which permits the chief operator to put the entire equipment "on stream" from the central control room in the pump station when the batch is scheduled to start.

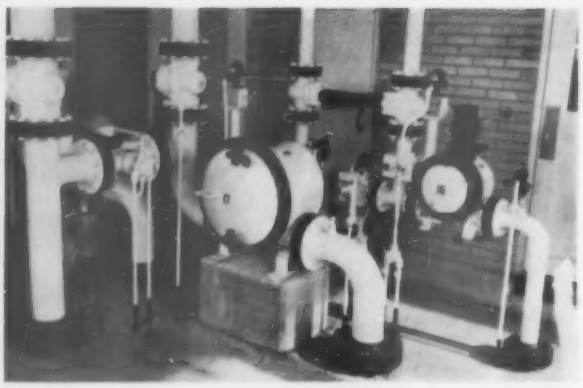
Along the rear of the whole bank of panels runs a main drive shaft powering the computer system, the brain of the blender mechanism. Behind the master panel is the drive for this shaft, provided by an electric motor through a continuously variable-ratio transmission.

The output speed of this transmission is controlled from a pneumatic instrument located on the side of the master panel to regulate the blend manifold pressure to match the requirements of the pipeline.

Outside the building on the meter platform are the blend manifold, the supply piping, the valving, and the meters to measure each component. Duplicate metering is provided to assure accuracy of measurement of a component regardless of its proportion or volume in the blend. From these meters, drive shafts transmit their motion to the computer mechanism on the component panel. The meters for each component are valved to allow selection of proper size meter for the component volume and the valves operate micro switches to interlock the meter to its proper panel and percentage computer. The throughput of each meter is controlled by a diaphragm valve discharg-



THIS BLEND MANIFOLD serves the North products line and contains block, check, and automatic control valves.



POSITIVE-DISPLACEMENT meters for one of the components. Drive shaft from meters goes through wall into control room.

ing into the blender manifold and controlled from the component panel in the blender building.

In rotating the main drive shaft, the ratio drives for each panel rack up quantities on their computers. Because in this case the computers have operated ahead of the meters, the indicators show the control valves opening.

Next, by rotating the meter shafts as they would rotate in the blender, there is an indication of the passage of fluid in the quantities demanded by each computer, and, as this is done, the control-valve indicators return to their previous settings.

In the actual blender, the main drive shaft, the computer shafts, and the meters all rotate constantly with the metered volumes exactly matching the demand quantities racked up by the computers, all under continuously and smoothly modulated control. Behind the component panel is the output shaft of the power-driven ratio unit rotating one side of the differential, the meter output shaft rotating the opposite side of the differential, and the control arm of the differential standing stationary.

The meter rate matches the computer rate from the panel. This differential control arm connects to and moves the indexing pointer in the pneumatic controller on the front of the panel. The output pressure from the controller adjusts the setting of the diaphragm valve on the discharge of the meter and is the final flow control for the proportioning of this component.

Minimum setup time . . . Preparation of the blender for operation is quite simple. Proportions of each component and lead requirements for a blend are furnished by the refinery dispatching department, and these proportions are corrected to take into account the proper factors for the meters to be used in the measurement of each component. The finished blend sheet is then given to the operator for his proportional component settings.

The operator proceeds to open valves to select the proper meters to handle the indicated proportion of each component. Inside the building he starts the blender drive, which permits him to check supervisory lights to assure lineup of proper control panels, test starts his field booster pump to guarantee that he has an operating pump and an open line, and rechecks the proper percentage figure on handwheel indicator. On the master panel the operator moves the master control from "set" to "blender conditioned" and checks the pressure setting on the controller which matches the blender's output rate to the pipelines variable input requirements.

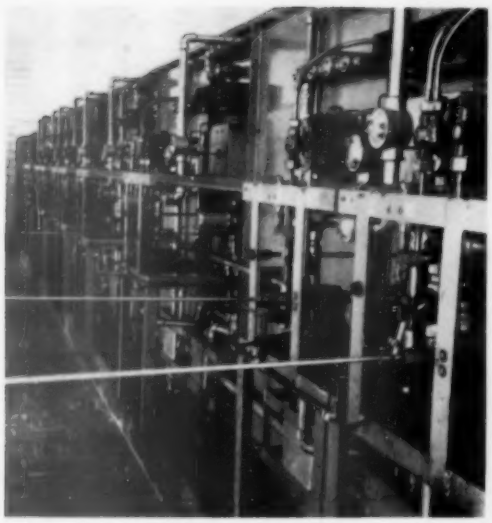
The operator now opens valves at the eductor pumps to start circulation through the eductor system and create vacuum for the controlled injection of lead. He then enters the building which handles the loss-in-weight lead blenders. He opens the scale cabinet, checks the balance on the weigh beam, closes the door, cranks up the proper cc's of lead to meet octane specifications, closes interlock circuit switches, and opens the lead valve, which actuates "ready to run for lead" light in main pump control house. Finally he returns to blender building and reports by intercom that blender is ready to operate.

Scraper traps for meter calibration loop. Connections for electrical tripping circuit are near rear trap.

Supervision of stream and lead blenders is in the central control room, and ready-to-run lights for stream TEL and dye blending indicate that everything is in order.

Going "on stream" . . . The pipeline is presumably receiving some other product but has dispatcher's orders to start a batch of gasoline, which may be house brand, premium or some special blend. He pushes button to start the blender booster pumps. When all pumps are on and all lines show pressure, the ready light goes out and the run light goes on. He then sets his product selector switch to gasoline blender and pushes its start button. This brings on red indicating light showing previous batch valve is closing. Gasoline blender output valve starts to open after 10 seconds. When the first valve is closed, its green light goes out. When the blender valve is open, its green light comes on and the red light goes out. Failure of red light to go out in 45 seconds indicates valves have not completed the switch.

The record of this tender change is shown on the gravitometer chart which aids the operator to see what goes on in the pump station. Composite and proportional samples of each pipeline shipment are pumped under continuous control into these sample containers and regularly collected for refinery analysis. This assures that all products meet re-



REAR VIEW OF PANEL housing blender control equipment. Drive shafts are from meters in blending manifold.

CONTROL PANELS for blending process. Right-hand panel is for East line and left for North line.

quired specifications or can be identified on the dispatcher's tape and subsequently set aside in pipeline terminal tanks for reblend or correction. Thus, the same equipment which produces the blended gasoline also provides its own evidence of proper blends.

Meter calibration loop . . . Any method of metering liquid is only as accurate as the means provided for proving the meter calibration. In this blender, meter calibration by removal of component from the blend while measuring in a tank would distort the blend, but for accuracy the meters must be calibrated. Therefore, a new approach was indicated. The meter manifolding permits the diversion of any component through an 800-ft. loop of 8-in. pipe before returning it to the meter being calibrated.

The ends of this loop have conventional launching and receiving scraper barrels and the displacement of the loop has been accurately measured with specially calibrated and tested meters. To calibrate a meter, a scraper is inserted in the loop launching barrel. On launching, this scraper actuates switches which clutch and declutch the trip counter on the meters at start and end of run.

At the upper right, the scraper leaves the barrel, trips a mercury switch and engages the register of the meter being calibrated (at the end of the loop it trips a second mercury switch and disengages the counter).

Accuracy of this calibration is in hundredths of 1 per cent, and is accomplished at the operating rate, pressure, and temperature without loss of component. Meter calibration is computed by comparison of the metered versus the displaced volume, and, in the meantime, the blend has not been disturbed.

Main-line meters . . . The total pipeline input is measured through two 8-in. Brodie meters, each handling up to 3,500 bbl. per hour. Calibration by conventional tank methods at those rates is impractical because of the losses involved. So again the displacement method is used which operators have nicknamed the "Miracle Mile". *(See The Oil and Gas Journal, August 9, 1954, page 84).*

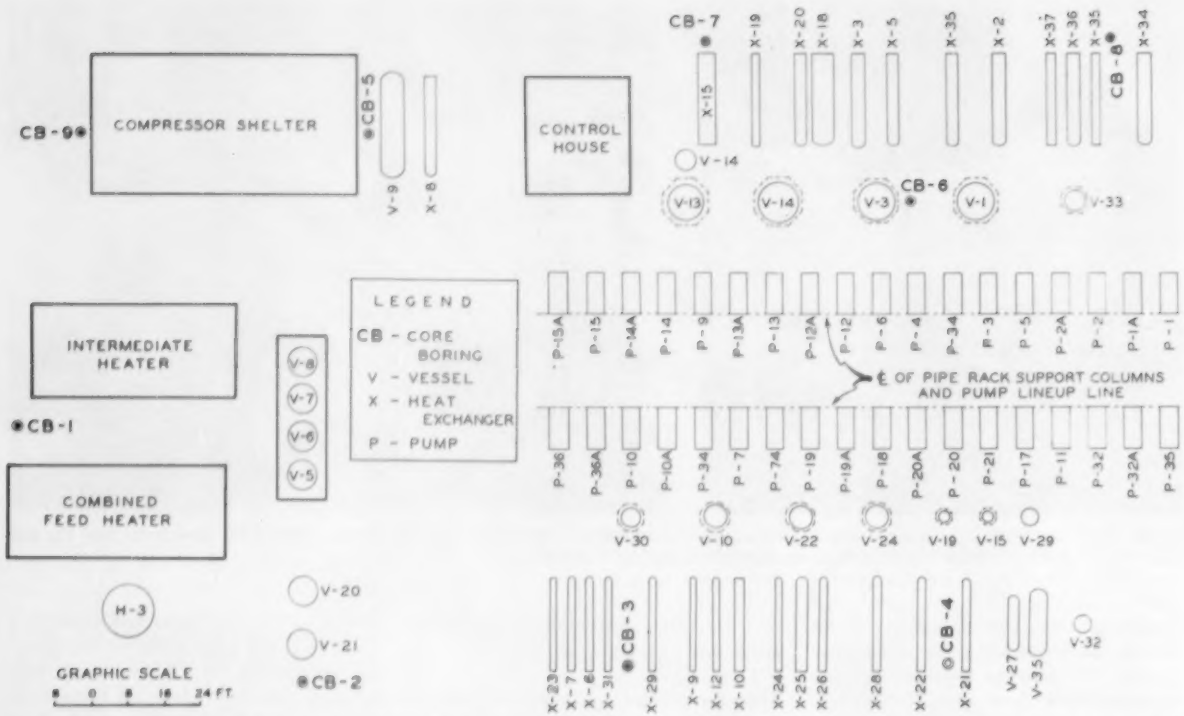
The main-line scraper trap permits the insertion and dispatch of scrapers which on leaving the trap engage the mechanical trip starting the calibration counter on the meter. Thirteen hundred barrels out on the main line another trap receives the scraper. On arrival this trips the mercury switch and declutches the meter to provide the registration from which the calibration is computed.

The unusual trap design at the end of the Miracle Mile serves another useful purpose. When it is desired to separate products by mechanical methods, two plugs are inserted in the Wood River outgoing trap. When the new batch face leaves the pump station, a plug is dispatched at the front of the interface and another in the pure product immediately following. These two plugs traverse the Miracle Mile and by their arrival in the trap start two new plug scrapers at the same points in the product stream so that the mixture stays between them and clean oil remains in front of the leading plug and clean gasoline behind the following scraper.

When two product separation plugs arrive at the next pump station, they operate trips at the receiving barrels which initiate by electrical sequences the kick out valves on the discharge traps. The separation of the two plugs is increased to accommodate slight addition to the interface as the between plug mixture goes through the station. This operation is still experimental but already the interface mixtures have been cut by some 80 per cent of the volume normally obtained with liquid-liquid interfaces.

The flexibility of the continuous stream blender can produce any gasoline specification at a moment's notice. New methods of measurement and meter calibration applied combine the advantage of large-capacity units at high rates with accurate calibration without interruption of flow. Plug separation of products in the pipeline eliminate the always present possibility of human error. These are all associated developments which add up to the ability of the pipeline to deliver any product, any place, any time, in full assurance that the produce will meet all demands of schedule and specification.

". . . During the period that it has been functioning, this type blending has proved much more accurate than conventional tank blending. The process . . . reduces the tankage required, the in-process stocks, and the time required for blending. . ."



CORE SAMPLES, taken at indicated points in the unit layout above, were analyzed to determine the advisability of using concrete piles. Fig. 1.

Concrete Piling Halves Foundation Costs

Less concrete, lower excavation costs, elimination of large forms

by F. Lawrence Resen

THESE PUMP BLOCKS rest on a solid—and less expensive—foundation of concrete pilings.

USE of concrete piling rather than solid blocks more than halved foundation costs for pumps and small vessels in the Platformer-Udex unit at Great Southern Chemical Corp.'s Corpus Christi, Tex., plant.

The procedure followed involved the pouring of concrete into holes to form two or three reinforced pilings at each pump location and then the pouring of a surface mat to support each pump. A similar method was followed for pipe supports and small vessel foundations.

Thus, savings were realized by using less concrete, by the cutting down of excavation costs, and by eliminating the need for large forms. A further advantage was in the speed—2 days vs. 2 weeks for excavations alone—in which the task was completed.

Investigation . . . Prior to the adoption of this method Great Southern embarked upon a detailed foundation investigation of the unit site to determine the advisability of using concrete piles. The study was devised to:

1. Use core borings drilled at the site to determine general soil conditions and provide undisturbed samples for laboratory tests.

2. Use appropriate laboratory tests to determine pertinent physical properties of soils encountered.

3. Analyze the resultant data to make recommendations relative to foundation depth and allowable bearing capacity.

4. Consider any other factors which might influence design or construction.

Exploration . . . The unit site was explored by a total of nine 3-in.-diameter Shelby tube core borings ranging in depth from 20 to 42 ft. Boring locations are shown in Fig. 1. Coring was continuous in all borings to a depth of 10 ft.; cores below 10-ft. depth were taken at 5-ft. intervals.

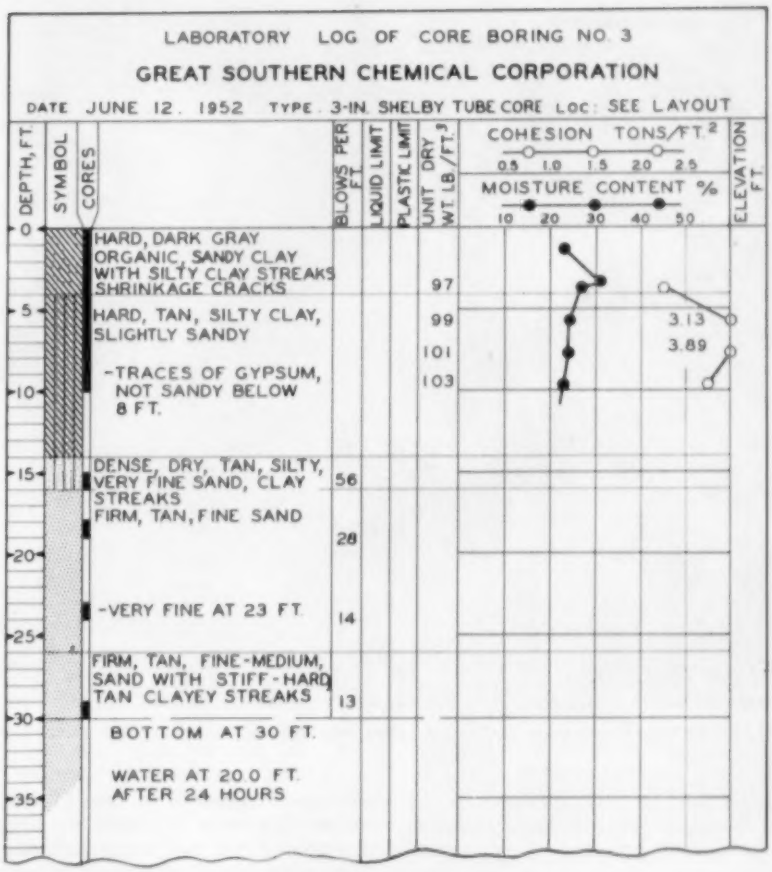
When sampling clays, penetration of the core barrel was forced by hydraulic pressure from the drilling rig; in sand, the core barrel was driven by blows of a 200-lb. hammer, dropped 2 ft. Numbers of blows required to cause a penetration of 1-ft. in sand were recorded at appropriate depths on boring logs for each core taken by this method. Fig. 2 shows a representative log of core boring No. 3, as shown on layout of borings.

Soil conditions . . . In this particular area, 4 to 5 ft. of dark-gray organic silty clay was present at the surface. This material varied from plastic-to-hard in condition and contained many large shrinkage cracks. An underlying stiff-to-hard slightly sandy clay, containing traces of gypsum, extended to a depth of 14-15 ft. below the surface.

Soil encountered below about the 15-ft. depth was predominantly firm to dense with some seams of clay. The sand stratum beginning at this depth was dry where first encountered but became saturated by a depth of about 21 ft. Core boring No. 8, which extended to a 42-ft. depth, showed dense sand, calcareous gravel, and some shell at 41 ft.

Lab tests . . . To determine the strengths of clays sampled, unconfined compression tests were performed on a total of 30 samples from all borings. Results of these tests were presented on the boring logs in terms of cohesion, computed as one-half the unconfined compressive strength, and include determinations of natural moisture content and dry density.

To extend the usefulness of the strength tests, moisture-content tests were made on 19 additional samples; Atterberg limits, as an aid to classification, were determined on 6 samples,



BY LOGGING this core boring, ample evidence of suitable piling foundation was accumulated. Fig. 2.

and one natural density was determined for a sample from 29½-ft. depth in CB-7. These tests were also reported on the boring logs.

Results of four linear shrinkage tests were performed on clay samples from CB-1, CB-4, and CB-7, as shown below:

Boring	Depth-Ft.	Linear-Shrinkage Per Cent
1	1.5-2.0	25.8
4	3.0-3.5	25.0
7	1.5-2.0	23.4
7	5.5-6.0	22.0

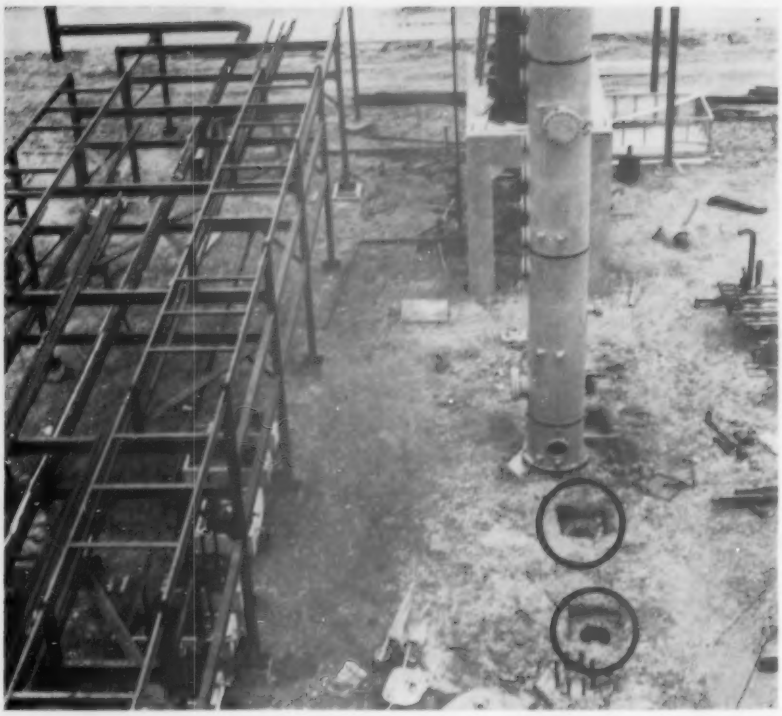
Bearing capacity . . . As a result of the investigation, shallow clays in their present condition were felt to be capable of supporting relatively high unit loads at any level. However, a study of moisture contents plotted on boring logs reveals that seasonal moisture content changes may occur to depths of 6 to 8 ft.

Atterberg limit and linear shrinkage tests show the clays to be highly active and subject to quite large volume changes in moisture content. For this reason, it was felt essential that foundations for important structures, which cannot permit moderate differential or total movement, be founded at a depth of at least 6 ft. below the present surface. Based on minimum values of cohesion from unconfined compression tests, the allowable unit loading for individual footings at this level was determined to be 6,250 lb. per sq. ft., for a factor of safety of 2.5 with respect to shearing failure.

Footings located at 4 to 5-ft. depth, loaded to 4,750 lb. per sq. ft., were deemed practical to support other structures which can tolerate differential movements of as much as 0.1 ft. It was recommended that design unit loadings on individual footings be close to the allowables in order to minimize movement due to expansive forces exerted by foundation soils.

Foundation mats were recommended to be located at a minimum depth of 4 ft. with a permissible loading of 4,750 lb. per sq. ft. Additionally, it was felt that floor slabs or shallow-grade beams for any structure should be underlain by a cushion of dry sand, 9-12 in. in thickness, and having a maximum plasticity index of 6.

Field tests . . . After the soil coring and analysis tests were completed, 12 test



REINFORCING RODS from the concrete piling were extended up into surface blocks for extra strength.

shafts were made which were placed according to the tentative location of the major foundations. These vertical shafts were then poured with reinforced concrete of 3,000 psi. construction to approximately 2 ft. above grade. They were then capped with metal trays and loaded with lead weights equivalent to specified foundation requirements.

Levels were taken upon the first loading and daily thereafter by use of instrument to determine any change in elevation. After there was no indication of change over a period of 21 days, additional weights were applied until there was a notable footing refusal which exceeded the 2½ per cent safety factor required.

Ream footers . . . As a result of the foundation investigation and the excellent performance of the test piling, it was decided that ream footers would be used under pump blocks and other minor foundations.

The main contractor was asked to design the proper size of piling, which naturally would vary in accordance with the size of the pump or vessel. In most instances, two pilings were used in each foundation, although some of the larger pumps required three. Most piling included four strands of reinforcing steel, with the diameter varying according to the load, although ⅝-in. rods predominated. The rods were tied together with circumferential rods spaced about 9 in. apart. Provisions were made to extend the steel rods upward into the block excavation. Thus, when the foundation mat was poured, it would be physically tied to the piling.

To facilitate the construction of the foundations, a subcontractor was called in to drill all of the piling shafts. These averaged about 9 ft. below grade. In drilling these shafts, a ream augur was used to widen a portion of the hole. Thus, on a shaft having a 1-ft. diameter, a ream augur would be used at a specified depth to widen the hole in a bell shape to a diameter of 2 ft. This, in effect, provided more actual bearing surface.

The ream augurs were used at varying depths according to the results of the soil analysis. The shaft would be drilled until a stable soil stratum was reached, the ream augur inserted to widen the shaft, and then the shaft drilled at its normal diameter to its total average depth of 9 ft. In some instances, the reaming would be done at the total depth, but the main purpose was to increase the bearing surface at the most favorable level.

Once the shafts were drilled, vertical reinforcing rods were inserted and concrete poured. This concrete was given a 24-48-hour settling time before the foundation mat would be poured. The mat was poured in a previously excavated hole, which included a 6-in. sand fill. These surface blocks varied in dimensions according to the size and base plate of the pump. However, each was poured 2 ft. deep, with 8 in. being below the grade line.

Once this block had set, the equipment could be placed into position and construction continued. Periodic checks have been run on these pump blocks since they were placed in service, with all holding up satisfactorily, under load conditions.

Comparative advantages . . . Some interesting comparisons may be made between this type of foundation, and the solid concrete block normally used in this locality. An initial comparison, and most significant, is between average costs for such foundations. These are itemized as follows:

TYPICAL CONCRETE BLOCK

Excavation costs:	
7 yd. @ $5 per yd. (hand labor)	$ 35
Concrete (pouring, rods, forms):	
7 yd. @ $60 per yd.	$420
Total	$455

TYPICAL PILING

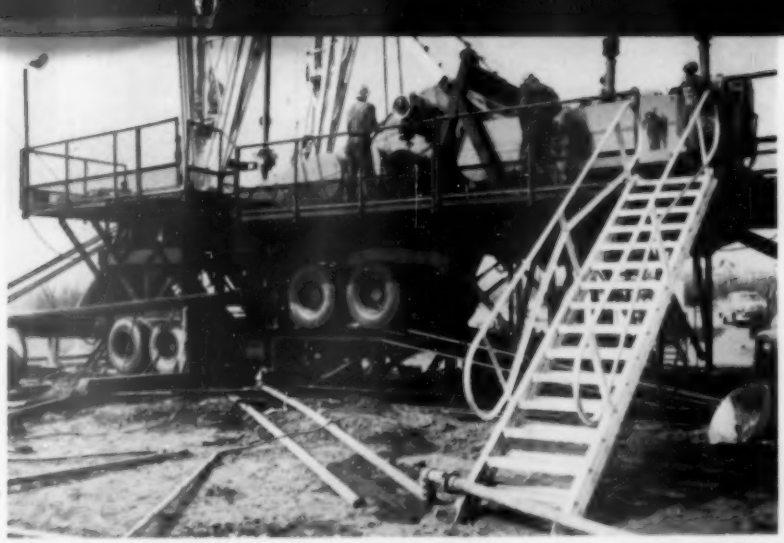
Excavation costs:	
Two shafts @ $5	$ 10
Concrete (pouring, rods, mat forms):	
3 yd. @ $60 per yd.	$180
Total	$190

A savings of some $265 per foundation can be seen, which assumes major proportions when it is remembered that this one unit required about 50 pumps, in addition to pipe supports and small vessels. Part of the savings will be shaved in some backhoe costs and the need for filling and tamping around the foundations due to sinkage, but this is a nominal expenditure.

The other comparison is in the time required for construction of the two types of foundations. For instance, it took approximately 2 days to drill all of the shafts required for the unit, and then it took 2-3 days to pour concrete in these shafts. Had the excavations been made for the solid block type foundations, the elapsed time would have run from 2-3 weeks merely for excavating, with additional time required for making large forms.

Acknowledgments . . . The cooperation of the management of Great Southern Chemical Corp., General Plant Superintendent M. T. McCants, and Chief Engineer F. G. (Jud) Hester, in the preparation of this article is gratefully acknowledged.

Procon, Inc., was contractor for the process unit; Fluor Corp., Ltd., was contractor for the offsite facilities.



The two trailers are coupled end to end, with the draw-works trailer wheels supported above the ground.

Magnolia's new

Two-Trailer Rig Moves Fast

A NEW two-trailer rig put in service by Magnolia Petroleum Co. in West Texas is making its moves between locations with a minimum of lost time. Only 12 hours was required recently to move the rig 35 miles to a new location, rig up, and commence operation.

Distribution of the load between two trailers permits use of higher-rated equipment than is normally possible on a single trailer. At the same time, weight per trailer is kept within the limit of 18,000 lb. per axle, which is enforced in a number of states.

The draw works, an Ideal T-20-S, a dual-type drilling engine, and mast support frame are on one trailer; total weight is distributed to place 17,710 lb. on each rear axle. The other trailer carries the 97-ft. Lee C. Moore mast, rotary substructure, and hook block. Each rear axle on the second trailer carries 16,750 lb.

The mast trailer is 35 ft. 11 in. from the kingpin to the center line of the dual axle. With the mast retracted to the traveling position, and folded over the cab of the tractor truck, it has an over-all length of 65 ft. 6¼ in. and a height of 13 ft. 6 in.

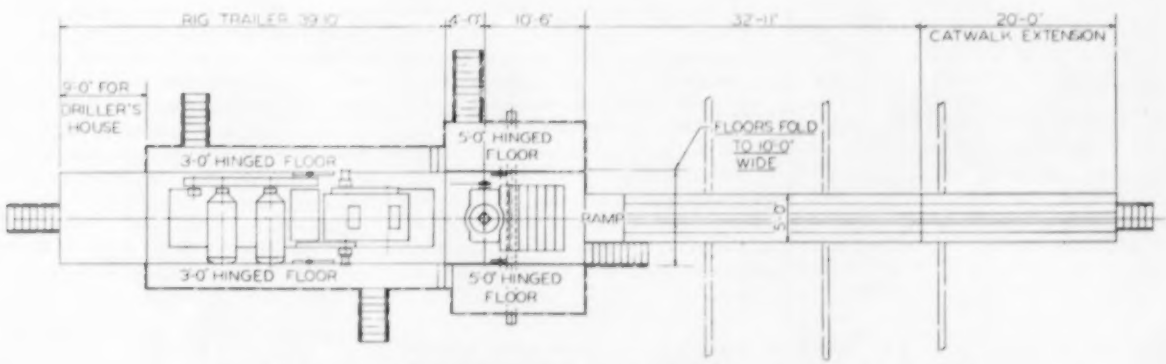
On arrival on location, the trailers are rigidly coupled, end to end. As shown on accompanying cut, ramps support the trailers at suitable heights above the ground to provide clearance for blowout-preventer equipment. Jacks distribute the weight of the load.

Power from the draw works is used to raise the gin poles and extend the top section of the mast in a horizontal position. The mast is then raised with the traveling block and a sling line. The back legs of the mast are attached to the support frame on the draw-works trailer. No guys are required.

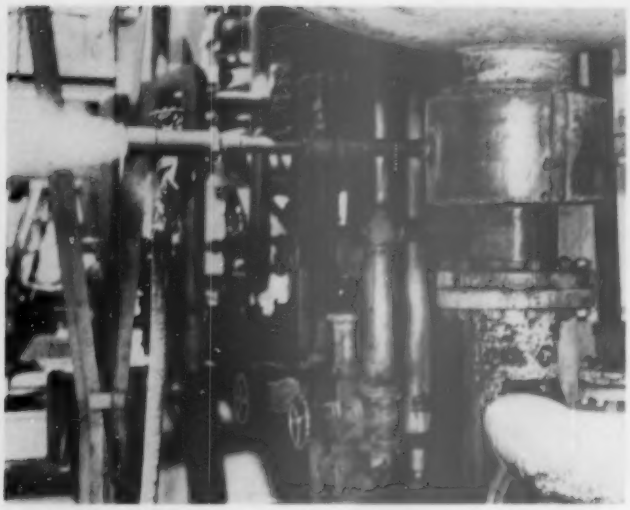
Hinged floors, which are folded out of the way while traveling, can be set up quickly at the drilling location, providing walkways for the crew. All air lines are manifolded into the substructure. Three metal stairways give access to the derrick floor from ground level.

The rig recently drilled two wells with 3½-in. drill pipe and ten 6-in. drill collars. One well had a total depth of 4,500 ft. and the other, 3,500 ft. On a workover, the rig used 2⅜-in. tubing on a 10,000-ft. well.

New two-trailer rig on location in West Texas. The walkway between the pipe racks is formed by the mast trailer.



Rig layout in operation. The duel-type drilling engine is fitted with torque-converter drive.



EMERGENCY REPAIR—Homemade steam jet is used to evacuate flue gas and catalyst while welder works on packing-gland leak in expansion joint, Fig. 1.

COLD-WEATHER JOB—Work on new heater in winter proceeded under tarpaulin with gas-fired tubes keeping temperature inside at 50° to 60° F., Fig. 3.

Here's how N.C.R.A. plans and improvises to achieve . . .

Better Refinery Maintenance and Turnaround

by J. V. Early, John Ward, Howard Andrews, and R. A. Lawrenz

PROCESSING units, appurtenances, and facilities which represent immense capital investment must be maintained properly so as to operate at peak efficiency and almost continuously. To accomplish this, with labor rates as they are, it is imperative that the maintenance organization be kept briefed as to the work to be accomplished and to be rigidly supervised.

Refinery background . . . At present, crude-oil throughput of National Cooperative Refinery Association's McPherson, Kans., plant is approximately 26,000 bbl. per day. Processing facilities consist mainly of a combination crude topping-coking unit, fluid stacked-type catalytic cracking unit, gas-concentration and catalytic polymerization unit, and treating units. The F.C.C. unit is processing 11,000 bbl. per day of gas oil and at present the refinery is not thermal cracking. Some of all the 15 products, including butane and propane, are loaded in trucks and tank cars at the refinery, while the majority are shipped via pipeline to other loading terminals. The coking unit is producing 250 tons per day of coke which is loaded out daily in railroad cars. In addition, 7 miles west of the refinery and serviced by pipeline, there are three underground propane storage wells of 150,000 bbl. total capacity (*The Oil and Gas Journal, September 13, 1953, page 111*). With the exception of the products pipeline, the maintenance of all the aforementioned is the responsibility of the refinery maintenance department, with a personnel of 85 employes. Five of these are daily decoking the coke chamber and loading coke, leaving 80 men for routine

NATIONAL COOPERATIVE REFINERY ASSOCIATION

Location and Service: Morley Cooling Tower Pit - Water Circulation

N. C. R. A. Equipment Number

Driven Equipment Mfg.: Ingersoll-Rand

Size: 14 APF
GPM: 7800
Head Feet: 133
Hydro: 75
Serial No.:
Machine No.:

Liquid: Water
Temp °F: 85°F.
Viscosity:
Sp. Gr.:
Impeller Dia.: 10-1/4"

Type:
RPM: 1200
Model:
Bearing No.: 1 - SKF 1314
Bearing No.: 1 - SKF 3642 K
Shaft Size @ Machine:
Packing Size: Depth:
OD
Packing Size: 1/2" John Crane 100-H
Mechanical Seal:
Mech Seal Sz. No.:
Shaft Sleeve Material: Bronze
Casing Material: Cast Iron
Casing Ring Material: Bronze
Impeller Material: Bronze
Impeller Ring Material: Bronze
Wear Ring Clearance: .008

Inst. Book:

N. C. R. A. Equipment Number

Driven Equipment Mfg.: Westinghouse Synchronous

Serial No.: 136F 286
Type:
H.P.: 300
RPM: 1200
Style:
Model:
Cycle:
Phase:
Bearing No.: Sleeve
Bearing No.: Sleeve

Temp Steam:
Steam Press:
Exhaust Press:
Needs:
Date:
Class:
Phase:
Temp:

Frame:
Phase: 3
Cycle: 60
Volt: 2300
Amp: 75
C' Rise: 40°C
Class:
S.O. No.: 6F 286

SCR PF
Exc. Amp. 20.5
Exc. Volts 125
Hr. 24

Auxiliary Equipment—Gear Reducers, etc.

Mfg. & Type of Equipment: Westinghouse D.C. Generator
Model No.:
Serial No.: 1 - 6F 662
Frame No.: 286
Size No.:
Coupling Mfg.:
Coupling Sz. No.:
Coupling Bore—Driver End:
Driven End:
Type H
Shunt Wound
K Load 100 Hr. 24
R.P.M. 3
Volts 125
Amp. 24
C° Rise 40
Style 6F 662

Driver RPM: 1200
Driven RPM: 1200
Ratio:

Packing Box Gasket or Other Data:

Starting Equipment

S. O. No.:
Mfg. of Equipment: Westinghouse Controller
H.P.: 300
Phase: 3
Cycles: 60
Volts: 2300

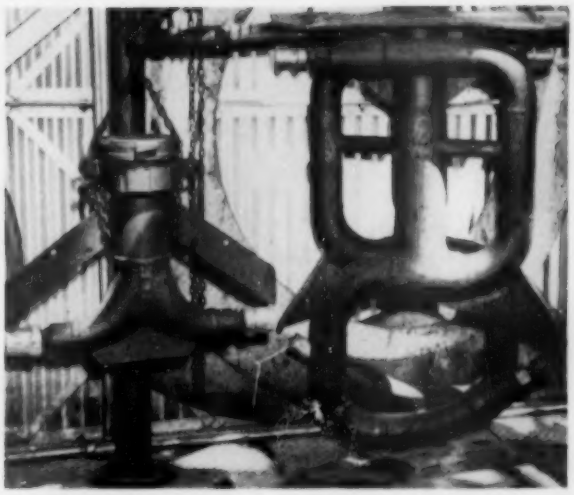
Order No. KTC-54450
Magnetic Operator 220V

Type:
Size:
Amps:
Class:
Frame:

PERIODIC OVERHAUL—This is a sample of the master record kept by the master mechanic of each piece of equipment in the N.C.R.A. refinery. Periodic overhauls are noted on cards filed with this record, Fig. 2.

Authors are with National Cooperative Refinery Association, McPherson, Kans. Paper presented at Western Petroleum Refiners' Association meeting at Wichita, Kans.

REVAMP—Keyholing of regenerator grid holes was minimized by welding Thredolets over holes and screwing in pipe nipples, Fig. 4.



REDESIGNED—Two cutting tools used in decoking chambers of N.C.R.A. delayed-coking unit. Unit at left is N.C.R.A. design, Fig. 5.

maintenance, new construction, housekeeping, etc.

Refinery Maintenance

The planning and scheduling of work are handled by our maintenance superintendent with the aid of an assistant and a master mechanic, in close cooperation with the other departments. This group receives all work orders, determines priorities, plans the work alone or with the craft leaderman, lines up all the material needed, schedules the work, and follows up on job progress. The types of jobs for which maintenance personnel are required, and some of N.C.R.A.'s solutions to these problems, are as follows:

Routine work . . . This is handled on standing orders and may include jobs such as housekeeping, cleanup, etc. A system has been established for cleanup which is most satisfactory, by the use of large tubs. These tubs are placed in inconspicuous places throughout the plant. As they are filled with waste materials, a winch truck readily hauls and empties them at the dump area. The advantage of this system is that trucking equipment is not constantly tied up on this type of work.

Routine assigned maintenance . . . All work in this category is done on work-order requests and priorities are assigned, with the scheduling prepared a day ahead.

Emergency repair work . . . This receives top priority over all other maintenance work. When a breakdown occurs, the necessary craftsmen are assigned immediately. Fig. 1 shows such a repair. This one we call "the welder's jet treatment." A packing-gland leak has developed in the expansion joint of the steam generator of the F.C.C. unit on the flue-gas side, necessitating boxing it in. The steam jet is homemade and produces a high vacuum inside the box so that flue gases and catalyst do not hinder the welder. This assures a fast, clean weld. On completion of the seal weld, the jet is removed and the coupling bull plugged. In cases of high-pressure leaks such as 220-lb. steam, the valve is left on the box and closed on completion of weld. Our experience for such repairs covers steam, water, air, catalyst, and some heavy oil leaks, any one of which could not be blocked in without costly operational difficulties.

Periodic equipment overhaul . . . This is done on an assigned basis and is planned well in advance by the planning and scheduling group. Schedules are determined from experience records kept on each piece of equipment and from preventive-maintenance inspections. Fig. 2 is the master record kept by the master mechanic of each piece of equipment in the refinery, large or small, in the most important service or relatively nonimportant. All pertinent information appears on this record. Periodic overhauls and inspections are noted on separate cards and filed, as they occur, with this record. This procedure affords a case history of each unit for future planning.

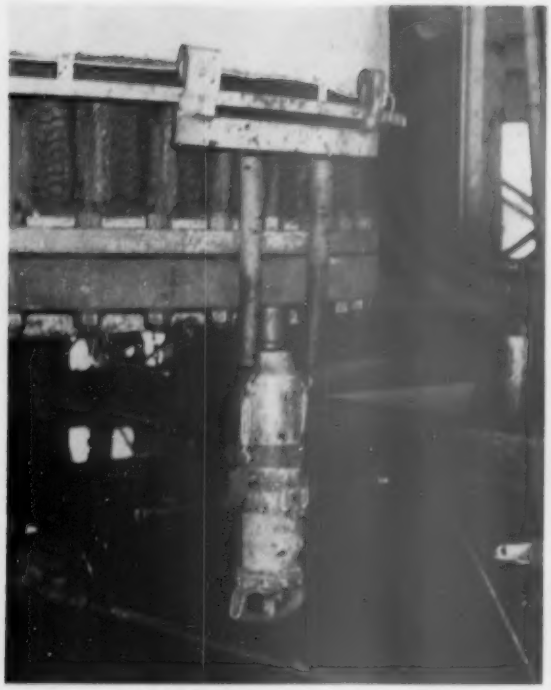
Preventive maintenance . . . Inspections are made daily, on an assigned scheduled basis, by craftsmen from the mechanical department. The responsibility for this work is vested in the master mechanic.

Long-range capital improvements . . . Our long-range planning for capital improvements is a function of our engineering department. The majority of this work is incorporated into maintenance schedules. For instance, we recently completed a new coker heater. Foundation, fabrication, and construction were all performed by our maintenance organization. Incidentally, this particular job developed into the priority class because of operational reasons. Therefore we were forced to proceed with the installation of a 5-in. gunite liner and brick work inside the heater during the months of December and January. Fig. 3 depicts our "cold-weather activities." Temperatures inside the heater and under the tarpaulin were maintained at 50° to 60° F. with gas-fired tubes. Atmospheric temperatures were ranging in the 20°'s during this period.

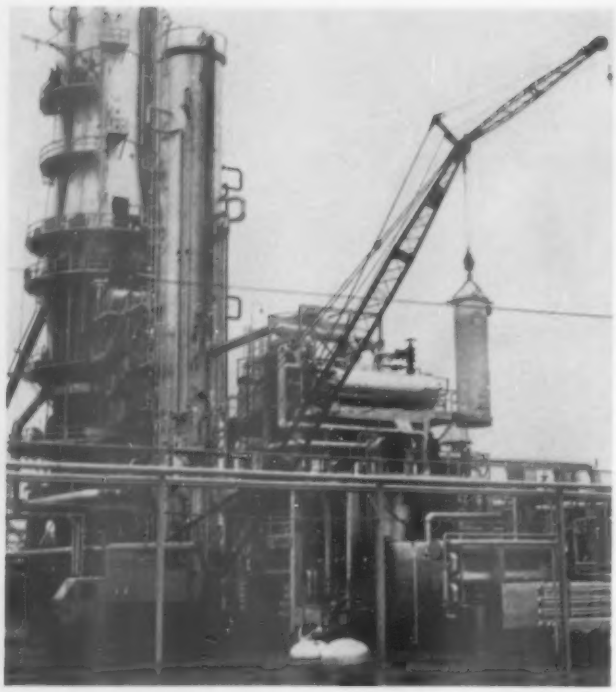
Maintenance Costs and Proper Planning

The question now arises: How is it possible to incorporate all of these various-type jobs into the maintenance program with any degree of smoothness, efficiency, and at a minimum cost? The paramount answer is simple; proper planning and scheduling, with close job followup and rigorous supervision. We are of the opinion that 85 to 90 per cent of all maintenance work can be properly planned and scheduled. To accomplish this, accurate records must be kept and studied on all equipment. Periodic inspection data, history of previous breakdowns, and operational conditions are most essential information for proper planning.

Operating efficiency . . . We must also recognize four other important factors which directly affect maintenance costs.



UNHEADING COKING CHAMBER—*Pneumatic tool set up as shown here cuts the time down to one-fourth of what it would take to do this job with hand tools,* **Fig. 6.**



POWER EQUIPMENT—**This mobile crane at the N.C.R.A. refinery is rated at 20 tons with 90° boom angle. Many man-hours are saved around the refinery with this crane, Fig. 7.**

First, we feel that the maintenance costs are directly proportionate to the operating efficiency. Everyone knows that misguided or sloppy operating procedures may result in many man-hours of excessive maintenance work. Also, if all jobs become emergencies, the scheduling system will fall apart. Too many maintenance man-hours can be wasted due to the operating personnel's inability to have equipment out of service and gas freed as scheduled.

Sound engineering . . . We also know that maintenance costs are directly related to the engineering department's competency. The type of equipment used, correct size and number of units, accessibility and simplicity of maintenance repairs, and revamping of faulty equipment make for decreased maintenance costs. A perfect example of this point is the regenerator grid of our fluid catalytic cracker. Prior to revamping, many maintenance man-hours were spent on repairs to this grid at each shutdown, due to wear or keyholing of the holes in the grid and resultant poor air distribution.

Fig. 4 shows how ⅜-in. Thredolets were welded over the existing holes; then ⅜-in. Schedule 80 pipe nipples, 2 in. long, were screwed into the Thredolet fittings. On the outer portions of the grid, ⅜-in. Schedule 40 pipe nipples, 6 and 12 in. long, were used to overcome the grid curvature. Also, bellows were spaced around the grid seal to alleviate weld cracks caused by expansion. After 12 months' operation, the pipe nipples showed little or no wear, indicating that regenerator grid wear, keyholing of holes, will be nil in the future, hence no maintenance.

Basic design . . . Fundamental design of processing units is a most important factor for control of maintenance costs. Our combination crude-coking unit which was put on stream in October 1953 has proved most satisfactory, particularly so since only one operator per shift and five maintenance men are used in addition to those required for a visbreaking operation. Redesign also plays an important role. Fig. 5 portrays two final cutting tools used in decoking our coke chambers. The one on the left is N.C.R.A. design. Note the difference in size which makes for ease of handling. We estimate that this tool has reduced coke-cutting costs about $20 per day because of its lower water requirements for the same cutting rate.

Tools . . . Equipment and tools play a big part in maintenance man-hours. All types of power tools are a necessity, such as impact wrenches, grinders, chipping and peening guns, drills, saws, etc. Fig. 6 shows our arrangement for unheading one of our coking chambers. This head is 6 ft. in diameter, having forty-two 1¼-in. bolt studs. With this equipment, two men remove this head in less than 25 minutes, where with hand tools it would probably require hours. Too, power equipment is essential. Fig. 7 shows our mobile crane in action. This unit is rated at 20 tons with 90° boom angle. Man hours required on jobs of this kind are reduced by at least 50 per cent, since obviously no time is required for rigging of gin poles, guy lines, etc. Other jobs around the refinery in which this mobile crane saves man-hours are innumerable.

Turnarounds

So much for refinery maintenance; let us now consider turnarounds. The fluid catalytic cracking unit at N.C.R.A. first went on stream in June 1951. Since that time, we have maintained a 6-month turnaround schedule on it and the gas concentration and poly units. At present, the combination crude topping-coking unit is operating on approximately a 3-month turnaround schedule.

Six-month turnaround? . . . With this schedule, the entire refinery processing units are turned around simultaneously, usually in October and in May. Someone may ask: Why the 6-months schedule? Why not 12 months? Or more?

From our experience, we feel the shorter runs are more profitable from both the operation and maintenance viewpoints. **Operationwise:** Over-all

yields and recovery are better with clean equipment, and operation is more uniform and more safe than when running on borrowed time. **Maintenance-wise:** Man-hours will be less, due to the fact that equipment does not require major repairs—or in short, a stitch in time saves nine. Since June 1951, we have had six turnarounds on the cat cracker. Total down time through May 1954 has been 72 days, or roughly 6 per cent. The shortest down time (oil out to oil in) was 9 days and the longest was 17 days. The longer shutdown was due to the tie-in of the new coking unit and the shutdown of crude production in Kansas last October. We realize this may be slightly higher than some other refineries but we feel that the greater capacity and better yields due to clean equipment make this turnaround schedule more profitable to N.C.R.A. In accomplishing this, no outside contractor has been called in; only maintenance and operating personnel of the refinery have been used.

Man-hours . . . In May 1953, the totals for the entire plant turnaround were: (65 per cent of these man-hours are operators.)

Fluid catalytic cracking unit	6,434
Gas concentration and poly units	2,339
Crude topping and visbreaking	8,106
Treaters, boilers, etc.	821
Total man-hours	17,700

In October 1953, the totals were:

Fluid catalytic cracking unit	5,936
Gas concentration and poly unit	2,969
Crude topping and coking	8,993
Treaters, boilers, etc.	679
Total man-hours	18,577

We estimate that 15 to 20 per cent of these man-hours were spent in design changes.

Work list . . . When a definite date has been determined for a turnaround, the next question is what work is to be done? Some 2 or 3 weeks prior to this turnaround date, a combined job list and work outline is compiled for each individual processing unit by the maintenance superintendent, who obtains his information from numerous sources. This rough draft is then presented at a general meeting attended by the refinery manager, processing superintendent, engineering department representatives, operating supervisors, maintenance superintendent, and the master mechanic. Herein, the entire work outline is discussed and agreed upon. The final copy is then printed for wide distribution. We have found it desirable to make as many as 100 copies.

TURNAROUND OF FLUID CATALYTIC CRACKING UNIT
(April 19, 1954)

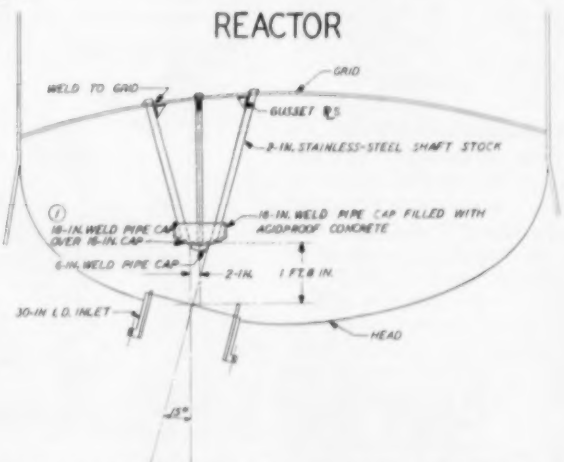
ITEM	ASSIGNED TO:	COMMENTS	CHKD BY:	COMPLETED BY:
1. REACTOR:		1.		
A- Unhead blind & top of vapor line.		A- 7/8" Bolts (6" Series 30 Blind) 1-3/4" Bolts & 2" Nuts on vapor line.		
B- Unhead 57" manhole.		B- 1-1/8" Bolts & 1-13/16" Nuts.		
C- Remove manway in grid & clean out catalyst.		C- 1" Bolts & 1-5/8" Nuts.		
D- Unhead manway at bottom of vapor line.		D- 1-1/4" Bolts & 2" Nuts.		
E- Inspect & repair as directed 24" vapor line.		E- 1-1/2" Bolts & 2-1/8" Nuts on 24" vapor line flanges.		
F- Inspect & repair grid & deflector as directed.		F-		
G- Inspect & repair cyclones as directed.		G-		
H- Inspect counter weights as directed on dip legs.		H-		
I- Renew thermowell & install guard in 24" vapor line as directed.		I-		
J- Inspect & relief valves of 24" vapor line to main column, clean & reset if necessary.		J-		
K- Get final OK & head up.		K-		

TURNAROUND—This sample of a turnaround work sheet shows how each step is outlined in sequence. Bolt and nut sizes are shown for each unheading job, Fig. 8.

TURNAROUND OF FLUID CATALYTIC CRACKING UNIT
(April 19, 1954) Page 2

ITEM	ASSIGNED TO:	COMMENTS	CHKD BY:	COMPLETED BY:
2. REGENERATOR:		2.		
A- Unhead top 24" manway.		A- 1" Bolts & 1-1/8" Nuts.		
B- Unhead bottom 72" manway.		B- 1-1/8" Bolts & 1-13/16" Nuts.		
C- Remove manway in grid & clean out catalyst.		C- 1" Bolts & 1-5/8" Nuts.		
D- Repairs: 1. Grid plate & seal.		D-1		
2. Spent catalyst pipe.		D-2		
3. Regen. catalyst scoop.		D-3		
E- Inspect & repair gunite lining as necessary.		E-		
F- Recondition all spray nozzles now in service.		F-		
G- Install new 2-stage set of cyclones complete.		G-		
H- Get final OK & head up.		H-		
3. CATALYST STRIPPER:		3.		
A- Open top & bottom manways & clean out catalyst.		A- Top manway- 1-1/4" Bolts & 2" Nuts. Man manway- 1-1/8" Bolts & 1-13/16" Nuts.		
B- Inspect & repair as directed.		B-		
C- Make any changes as may be directed		C-		

WORK LIST—Exchangers and coolers are numbered on this list, and again nut and bolt sizes are given, Fig. 9.



REACTOR GRID—Erosion in center area of reactor grid was minimized by welding pipe caps as shown to divert wear away from center, Fig. 10.

At least a week prior to the shutdown, copies of the work outline are passed to all supervisory personnel and to each craft leaderman in the maintenance department. The craft leadermen are then briefed individually on all jobs in which they will be either involved or responsible for. Thereafter, a day or two in advance of the shutdown, a general meeting of all maintenance personnel is held. This meeting usually lasts an hour, with a general discussion of forthcoming work and questions and answers.

Control copy posted . . . The control copy of the work outline on which assignments of work are shown is posted in the control room of each processing unit on a special turnaround bulletin board. Here is the focal point of the turnaround. As the work continues, the status on each job is noted on this copy, thereby presenting a continuous picture of progress being made.

Fig. 8 is a sample of our work sheet, covering the reactor of our F.C.C. unit. Note that each step of work is outlined in sequence. Also bolt and nut sizes are shown for all unheading jobs. This expedites the work immeasurably as no time is wasted in procuring the correct wrench size. Too, note that each job is assigned by the maintenance superintendent, is okayed by and signed for by the inspector, and is signed for by the leaderman when completed. Following the same outline (Fig. 9) here is the work list covering the regenerator and catalyst stripper of our F.C.C. unit. The entire turnaround work list for each processing unit is compiled following this outline, to include all vessels, fractionators, exchangers, coolers, etc. One other point, we have numbered all exchangers and coolers. This number appears on the work list in addition to nut and bolt sizes. This definitely expedites procuring correct-size gaskets and tubes if required from the storeroom.

Turnaround inspections . . . The objective of every turnaround, of course, is to complete the work in a satisfactory manner as fast as humanly possible. With our thoughts concentrated on this point, we may be prone to forget a most important fact, rigorous and efficient inspection. The data collected on turnaround inspections are the paramount guides for successful operation and for bringing to focus the need for alterations so as to realize the full usefulness of the equipment. The latter was our experience concerning our F.C.C. reactor grid. After 1 year's operation, we found that half of the metal thickness had been lost in the center area of the grid. After a pooling of ideas, a reactor-riser target was installed below the reactor grid and above the catalyst riser inlet, as shown in Fig. 10. *(See also The Oil and Gas Journal, November 2, 1953, page 120).* These weld caps functioned as a target and forced the wear on the grid outward and away from the center area. As a result of this installation, we realized 2 additional years' service from the grid. Although this target did greatly increase the grid life, it was deemed advisable to use a different-type device when the new grid was installed.

BOOKS

A.S.T.M. STANDARDS ON GASEOUS FUELS. Sponsored by A.S.T.M. Committee D-3 on Gaseous Fuels. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia. 184 pp., $2.50.

The latest approved form of all A.S.T.M. test methods for gaseous fuels are compiled in this 1954 issue. Twelve A.S.T.M. standards are included, of which five are new tentative tests and five are revisions of previous tests. The new tentative tests cover: sampling manufactured gas; sampling liquefied-petroleum gases; analysis of carbureted water by mass spectrometer; sulfur in petroleum products, and L.P.G. by the CO_2-O_2 lamp method; and vapor pressure of L.P.G.

EVALUATION OF 20 QUALITATIVE TESTS FOR PETROLEUM SULFUR COMPOUNDS. By Clarence Karr, Jr. Reprinted from Analytical Chemistry, Vol. 26, March 1954, official publication of the American Chemical Society. 9 pp., available free on request from Mellon Institute of Industrial Research, Pittsburgh 13.

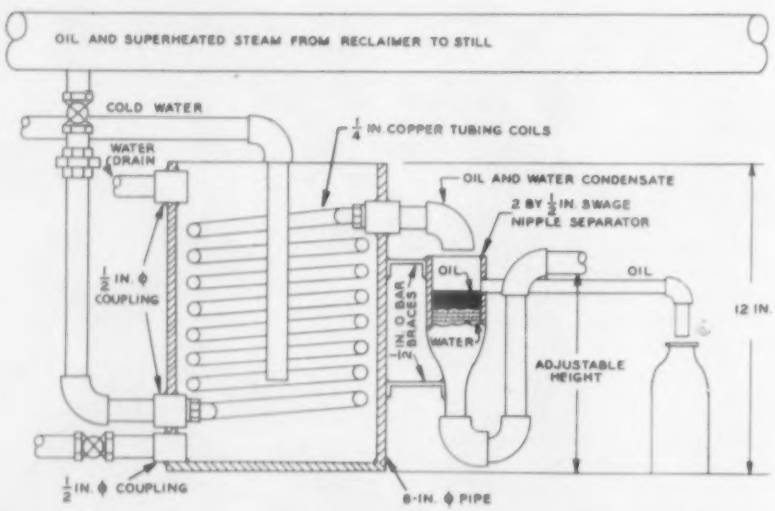
Fifteen different petroleum sulfur compounds in twenty different chemical reactions were examined to determine the value of these reactions as qualitative tests. This text is a compilation of the findings. Some of the reactions employed have been used previously for detection of sulfur compounds, but at least half are believed to be new qualitative tests. Test procedures are described for aliphatic and aromatic thiols, aliphatic and aromatic disulfides, aliphatic cyclic and aromatic sulfides, thiophenes, and condensed thiophenes.

How to Collect a Water-Free Oil Sample

USE of a swage nipple and adjustable water leg permits collection of a water-free oil sample from a line containing a mixture of oil and steam, without danger of losing the sample while water is drained automatically.

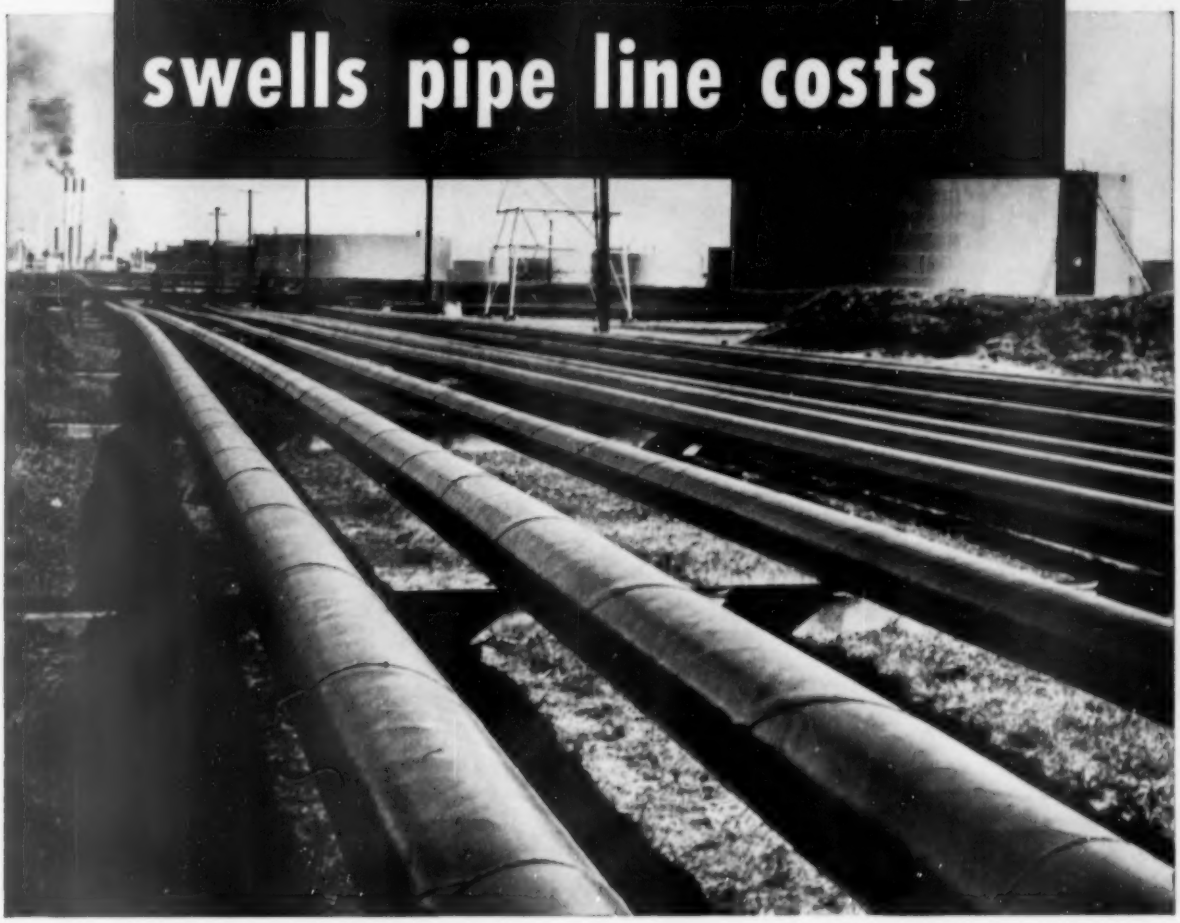
The original method of allowing the mixture of oil and steam to condense into a jug or bucket required continuous attention so that the vessel would not overflow and the sample would not be lost. By addition of the swage nipple braced to the coil tank, the condensed mixture running into the swage is separated by gravity.

By adjusting the water leg connected to the bottom of the swage, the water is automatically drained while the desired oil flows into the sample container from a top oil-overflow connection. It takes from 2½ to 4 hours to obtain sufficient sample for analysis. With the new arrangement, only intermittent attention is required during this period and it is estimated that the change saves at least an hour of the sampler's time which he can devote to sampling of other streams. (Suggestion by A. J. Lefevre, Phillips Petroleum Co., natural gasoline department.)



By adjusting the water leg connected to the bottom of the swage so that water drains automatically, a water-free oil sample is obtained.

How "OVERWEIGHT" pipe swells pipe line costs



Would you buy 6,000 feet of pipe for a mile long pipe line? In effect, you do just that when you buy line pipe with excess wall thickness.

Suppose your specifications call for 16" (O.D.) steel pipe with a minimum wall thickness of .188-inch. But the nearest wall thickness available from your pipe supplier is .219-inch. That 1/32-inch difference would mean almost 14 extra tons of metal in every mile of your line—enough for 865 more feet of pipe in the correct thicknesses.

You can keep "overweight" pipe to a minimum by specifying Armco Welded Steel Pipe. With the 132 combinations of diameters and wall thicknesses, it's easy to get exactly the pipe you need. Diameters range from 6 to 36 inches; wall thicknesses from 9/64" to 1/2" (including .188 *and* .219).

You save too with the extra long lengths of Armco Steel Pipe. There are fewer sections to handle and fewer joints to make over a given length of line.

Armco Welded Steel Pipe is recommended for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write us for complete information. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3094 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO Welded Steel Pipe ARMCO

AMPHIBIOUS "David Buggy" (top) runs as well through this swamp as it does through marshes and hilly country. In swampy areas of Louisiana and Texas, it is sometimes used to pull "flotation wagons" (bottom), big-tired trailers that can be pulled on highways as well as through swamps.

FIVE MEN put their weight on a "Jonnie Motor," a portable shot-hole drill that can bore up to 250 ft. of hole. Normally only three men are needed.

Now being used in Texas and Louisiana, this new equipment was . . .

Designed to speed up swamp operations

by William P. Sterne

A PORTABLE shot-hole drill that can be operated by two men and broken down into two 37-lb. loads; an amphibious, self-propelled vehicle that can travel over land, water, marshes, and tree swamps; a trailer that can be pulled on land or water—these are typical of the specialized equipment now being used in the swamplands of Texas and Louisiana by various oil companies and geophysical firms.

Perhaps the key piece of this equipment is the "David Buggy" (named after its designer, young David Crowell of Houston, who owns Crowell & Crowell). It is a self-propelled vehicle weighing 1,700 lb., powered by a 10-hp. gasoline engine, and fitted with two forward and two reverse speeds.

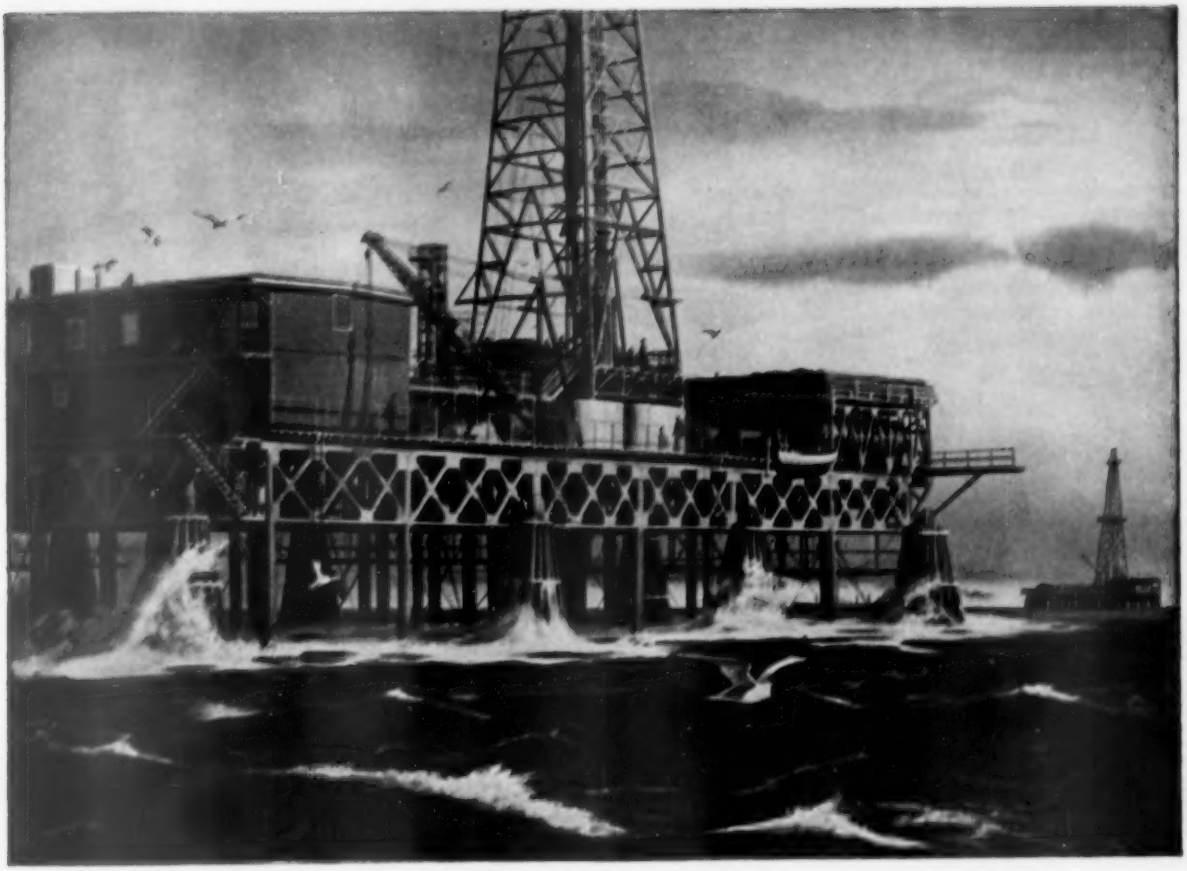
The buggy, completely amphibious, will run equally well in water or on land—and on any other type of terrain. Unlike some larger "swamp buggies" which may become damaged on hard surfaces, the David Buggy can't be stopped by many things short of a vertical wall. And anyone who has ever driven a car can drive it.

This buggy can not only chug along by itself in shallow or deep water, but any moderate-speed motor boat can take it in tow and it won't swamp. The buggy can be fitted with its own special trailer, for hauling behind a car or pickup truck while on the highway.

Shot-hole drill . . . The portable shot-hole drill mentioned can ordinarily be operated by only two men (three when a difficult hole is being attempted). Weighing only 75 lb. complete, its main advantage is that it can be broken down into two 37.5-lb. loads for easy carrying in difficult working areas.

Known as the "Jonnie Motor," this portable drill, powered by an 8-hp. gasoline air-cooled engine, can punch a hole down to the bottom of a lake, swamp, or marsh to depths up to 250 ft. The drill can be installed on an amphibious trailer or on an aluminum skiff-type pontoon float, or "flat." No experience is needed to operate the drill. The speed with which it works can enable a crew to drill at least 15 more holes during a 10-day work period than conventional portable-drilling methods. Use of the Jonnie Motor also decreases need for additional pontoons, boats, or marsh buggies which must transport heavier drilling equipment and additional men for the larger units.

When a crew uses the portable unit with a 7-hp., 57-lb. pump, a total of 15 hp., weighing 137 lb., is utilized in



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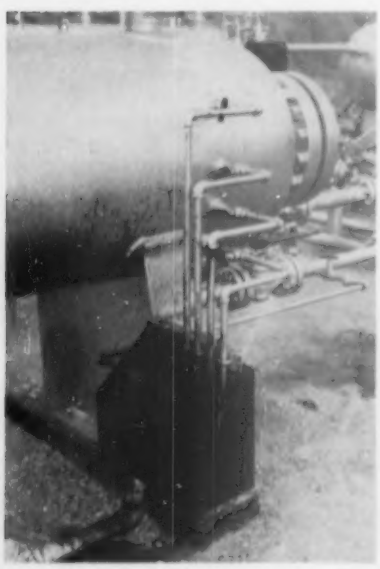
drilling the hole. In some locations drillers have been known to punch a hole down to 140 ft. in less than an hour. On one job production was increased 100 per cent and fatigue of the drillers was reduced over conventional portable drilling methods.

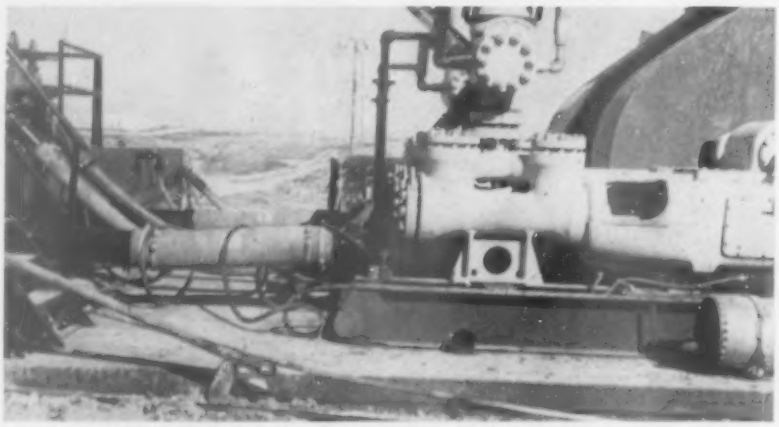
Flotation wagon . . . Another amphibious vehicle, nonselfpropelled, is a four-wheeled trailer called a "flotation wagon." It can be hauled by the propelled David Buggy on land or in the water, and has enough capacity to hold the Jonnie Motor and related shot-hole drilling equipment and crew. It will not sink or capsize. Not only can it be drawn through swamps and over water, but it can also be hooked on the back of a car or truck and pulled along the highway.

Sampling lines tap separator shell

SAMPLING lines tapped by the manufacturer into the shell of its horizontal separators enable Richfield Oil Corp. to readily determine the fluid level and get a sample of the fluid passing through the trap. Any drippings from the lines or overflow from the sample are caught in this sheet-metal basin. From there they drain through a check valve into the sump. In this manner, its trap farms are kept free of spilled oil, or any which might result from a leaking sample cock.



INSTALLED by the manufacturer, these sampling lines help eliminate spilled oil.



Special pad gives rig firm foundation

CLYDE HALL, drilling contractor of Bakersfield, Calif., has equipped one of his heavy rigs with a steel-covered timber pad upon which the mud pumps are set. This rig is currently drilling McKittrick area where soil conditions require a firm foundation for drilling equipment.

The pad itself is more or less conventional in size, but is built with laminated 2 by 12's bolted together as a unit which can be moved without separation. The entire floor, sides, and ends are covered with steel plate, perfectly smooth, and tucked under at the edges to prevent buckling and separation.

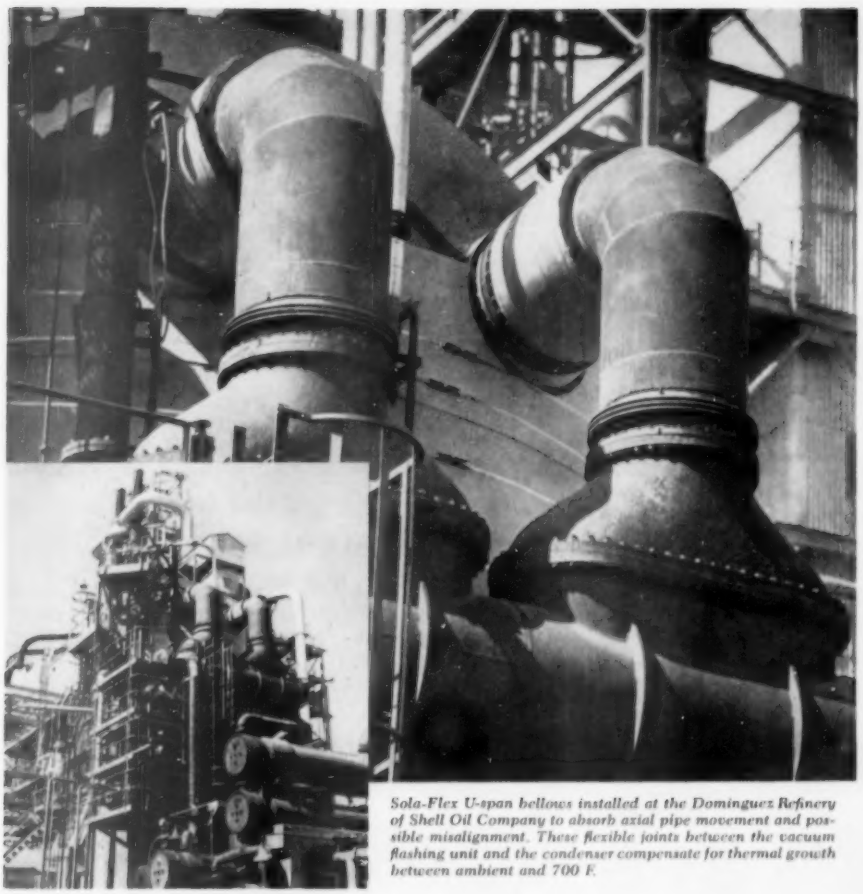
This type of floor covering lends itself to welding temporary anchors and the like to the surface instead of using spikes or lag screws to retain the equipment. Good housekeeping is also promoted because a hose can be used for flushing debris from the surface, unimpeded by splinters in planking.

Sea-going tank serves offshore well

TRUCKING service like that supplied by vacuum tank trucks in California onshore oil fields are now being supplied by a barge-mounted tank at the exploratory well Monterey Oil Co. is drilling 1½ miles offshore from Seal Beach. In place of a truck pulling up to a well, the barge moors alongside the 50 by 75-ft. wharf constructed on the landward side of the 75-ft. diameter, earth-filled drilling island.

By means of a 60-bbl. vacuum tank and pumping facilities mounted on the barge, all drilling fluids are transported

ABOARD the barge, tank and pumping engine form a background for Charlie Boyd (left), tool pusher, and Jim Ogden, partner, of Chancellor & Ogden, Inc., operators of the barge.



Sola-Flex U-span bellows installed at the Dominguez Refinery of Shell Oil Company to absorb axial pipe movement and possible misalignment. These flexible joints between the vacuum flashing unit and the condenser compensate for thermal growth between ambient and 700 F.

Solar-Flex Expansion Joints are winning wide acceptance

THE USE OF SOLA-FLEX expansion joints has grown rapidly in recent years in the petroleum and chemical industries. Sola-Flex joints are based on new engineering designs offering unique advantages that are establishing new standards of acceptance among engineers.

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Sola-Flex catalogues offer a complete range of sizes in standard expansion joints, convoluted couplings, and special designs to meet high or low pressure requirements. Experienced Solar engineering teams are available to develop custom designs for special applications.

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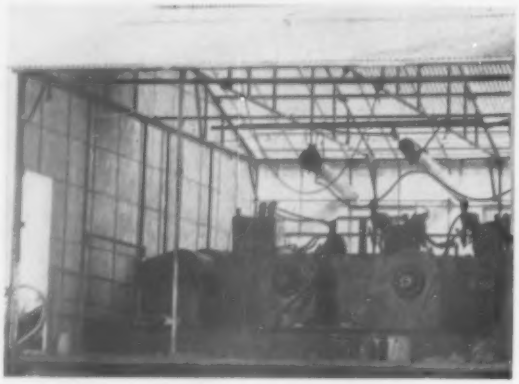
to and from the drilling island. Some freshwater storage is provided at the location, but because of the limited amount all water-base muds will be mixed on shore and barged to the well site.

Waste materials accumulate in a sump on the island from where they are pumped into the barge vaccum tank. Barged to the dock at Long Beach, the waste then is picked up by vacuum trucks and moved to the disposal dump.

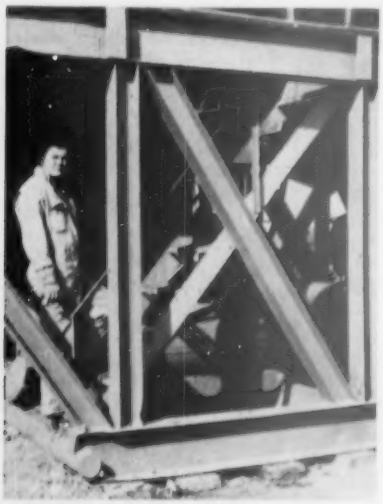
As is shown in the accompanying photo, power is supplied by a two-cycle diesel engine. It belt-drives two vacuum pumps which connect to the skid-mounted vacuum tank through flexible couplings. Through a reduction gear it also drives a 3-in. pump used for washing out the tank and for transfer of water or diesel fuel.

The unitized tank, manufactured by Thompson Tank & Mfg. Co., Inc., is being operated by Chancellor & Ogden, Long Beach vacuum-truck operators.



Translucent siding brightens work

CORRUGATED translucent material used in the construction of the engine house and the derrickman windbreak have made work light on Big Chief Drilling Co.'s Rig 31. The pattern of the sunlight shows plainly through the walls and should reduce some of the daytime load on the light plant. The product is manufactured by Libby, Owens, Ford.



Built-in stairway

THIS is one of the stairways built into the substructure of a Kirkpatrick Oil Co. drilling rig. Charley Greene, pusher and designer of the substructure, is shown ascending the stairway that gives access to the pumps and mixing operation.

On the opposite side of the rig is another stairway which leads down into a dressing room that is integrated into the substructure.

This substructure has clearance sufficient to skid the rig off a high-pressure christmas-tree installation, but the only stairway that protrudes is the one on the rear end of the dog house.

New device "watches" mud system

A DRILLER can now keep constant watch on the level of his mud pits and the volume of flow in his lines, thanks to a new "gadget" designed by Tom Neal, tool pusher and Louis Sinor, driller, both with Dillard-Waltermire, Inc.

The "Mud Signalite" which is now being manufactured by Mud Signalite Rental Co., Houston, enables the driller to tell at a glance just how his mud system stands.

Consisting of a panel of microswitches and a bell that sounds when mud pressure drops or when the level in the pits gets below a certain point, the Mud Signalite is tied into a specially designed switch. This switch is activated by a float in the pits and a flapper mounted in a coupling between the bell nipple and shale shaker on the mud line.

If the mud level falls below a certain predetermined point, a red warning light flashes on the visual panel mounted near the driller's post on the draw works, and the bell rings. The float actuates the switch, which in turn activates the warning light and bell.

The switch automatically resets itself to normal operating conditions once trouble has been located and corrected.

If the volume of flow in the mud line suddenly drops below a predetermined velocity, the flapper in the coupling actuates the switch and thus gives the warning.

The advantage of the setup is that the driller no longer need have some one go back and check the mud pits, or keep a "watch" on the mud line.

Signal system . . . Each Mud Signalite signal panel consists of eight indicator lights.

There are light indicators to tell the driller when (1) there is no flow in the flow line; (2) when the flow line is on "low flow;" (3) when the line is on half flow, (4) when the line is on full flow, and (5) there are warning lights which will show the driller in an instant (6) when the mud puit is losing from its predetermined level, (7) when it is at normal level, (8) when it is gaining, and (5) when the flow line overflows.

INVENTORS Tom Neal (right) and Louis Sinor with their Mud Signalite warning panel.

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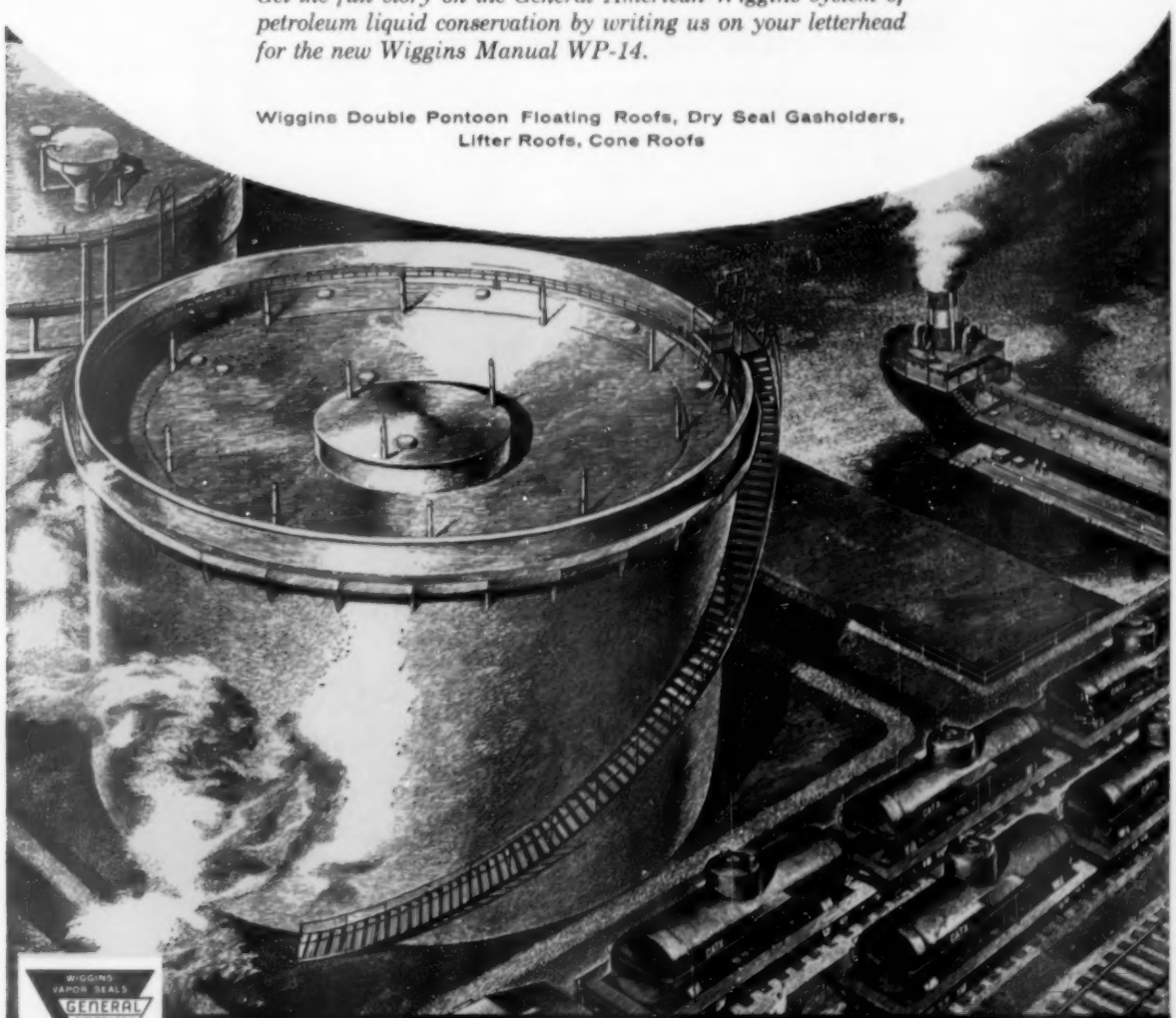

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by
Harold Woodhouse

Increasing Pipeline Capacity With Centrifugal Compressors—2

IF we increase the compressor-station discharge pressure in two steps from P_2 to P_{2a} and then to P_{2b}, keeping both the compressor speed and the volume Q at inlet conditions constant, i.e., constant Q/N, we will have the three envelopes of suction pressure and volume ranges as shown by Fig. 4.

It will be noted that with these conditions of constant Q/N for three discharge pressures, the volume of gas in standard cubic feet increases with compressor discharge pressure.

If we plot the pipeline characteristics showing station suction pressures for various flows and the three discharge pressures, P_2, P_{2a}, P_{2b} previously selected, we will have three curves something like those shown in Fig. 5.

If, now, we superimpose the compressor performance envelopes of Fig. 4 on the pipeline characteristic curves of Fig. 5 as shown in Fig. 6 we will probably find that, unless some changes are made to the compressor for operation at discharge pressures, P_{2a} and P_{2b}, the pipeline characteristics will not pass through points A_a and A_b corresponding to maximum efficiency at 100 per cent speed and capacity. In this event the compressor would operate at some Q/N corresponding to a lower efficiency.

It must also be noted that although the compressor is handling the same volume at each of these three discharge pressures, P_2, P_{2a}, P_{2b}, the horsepower required to drive it will increase with discharge pressure and this might be beyond the ability of the prime mover.

Adjustable guide vanes . . . Should the compressor be provided with adjustable inlet guide vanes, it might be possible to adjust these vanes so as to reduce the head developed and increase the capacity to match more closely the pipeline characteristic. While this would be possible if point A_b fell below the pipeline curve as shown and a reduction of pressure ratio is indicated, it would not be possible if A_b fell above the pipeline curve as indicated at A'_b because an increase in pressure ratio is then required and it is assumed that the compressor inlet vanes are set to give maximum head when operating at A against discharge pressure P_2.

For the speed range selected, the possible range of operation, neglecting the effect of adjustable inlet vanes, at the highest discharge pressure P_{2b} is along the pipeline curve from B_b to C_b.

If the performance envelope were displaced to the right in relation to the pipeline characteristic so that point B_b on it fell to the far left of the minimum - speed, minimum - capacity, compressor suction line, it would be well removed from the constant Q/N line for maximum efficiency (which line passes through A_b). A considerable drop in compressor efficiency could be expected when it operated in this region.

For variable-flow operation, it is advantageous to have point A_b slightly below the intersection of the maximum-efficiency Q/N line and the pipeline characteristic.

Author is chief engineer, Dean Hill Pump Co., and consultant on compressor design.

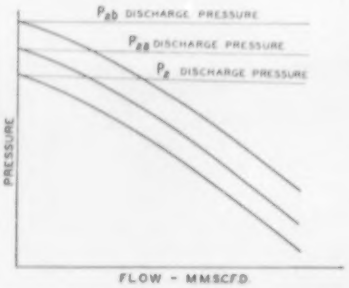

Fig. 5—Pipeline characteristics at the three different discharge pressures.

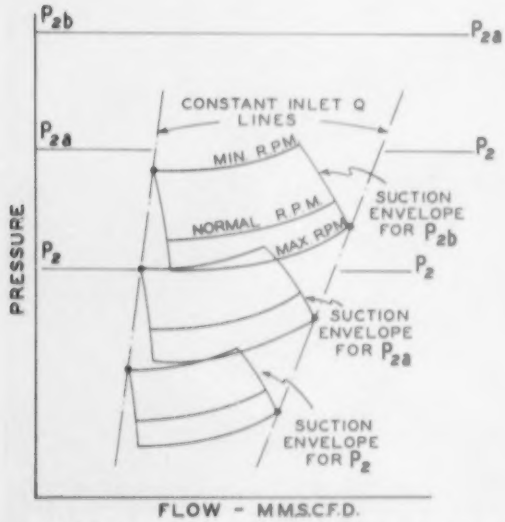

Fig. 4—What happens when compressor-station discharge pressure is changed in two steps from P_2 to P_{2a} and then to P_{2b}.

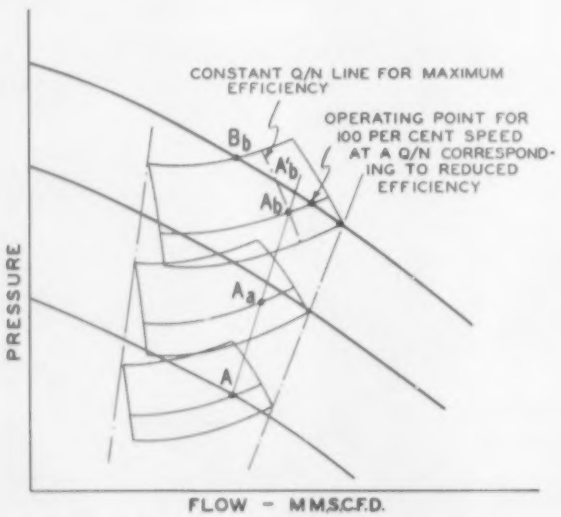

Fig. 6—Here the compressor performance envelopes of Fig. 4 have been superimposed on the pipeline characteristic curves.

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by R. I. Martin

ELECTRIC LOGGING—40

Measuring Resistivity in Microvolumes

THE resistivity of a small volume, referred to as the microvolume, may be measured in three ways:

Measuring device—	Reference
AM_1 micronormal	1-in. micronormal (or 1-in.)
AM_2 micronormal	2-in. micronormal (or 2-in.)
AM_1M_2 microinverse	1 by 1-in. microinverse

It is the practice to record two curves simultaneously. AM_1 has the shortest normal spacing and is influenced largely by the mud-cake resistivity. AM_2 has twice the spacing and a larger depth of investigation. Consequently it is more influenced by the resistivity beyond the mud cake.

The three-electrode spacing AM_1M_2 actually has a smaller depth of investigation than the two-electrode spacing AM_1, because of the different response of the three-electrode device. As a result, the two resistivity curves usually recorded are the 2-in. micronormal and the 1 by 1-in. microinverse.

Possible resistivity distributions and the resulting apparent resistivities recorded by these devices will be considered now.

Fig. 1 shows the resistivity of the formation R_t which is extremely high, as for example, a dense limestone. The wall of the hole is never smooth so that a film of mud of variable thickness will be present between the pad and formation. Even though the film may be thin, its effect is relatively important when the formation resistivity is high. Consequently, the resistivities recorded on the various MicroLog curves will be considerably higher than that of the mud, but much less than the true resistivity of the formation.

Impervious Beds of High Resistivity (Case I_1)

Assuming that the 1 by 1-in. gives a value of about 75 R_m, then the 2-in. may give a resistivity equal to this, or higher, or lower depending on the relative importance of the leak through the mud film. It is emphasized that in this case all the resistivity values are very much higher than the mud resistivity. The dash horizontal line, R_{lim}, shows the maximum resistivities which could be observed in front of a permeable bed. This will be considered later.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.

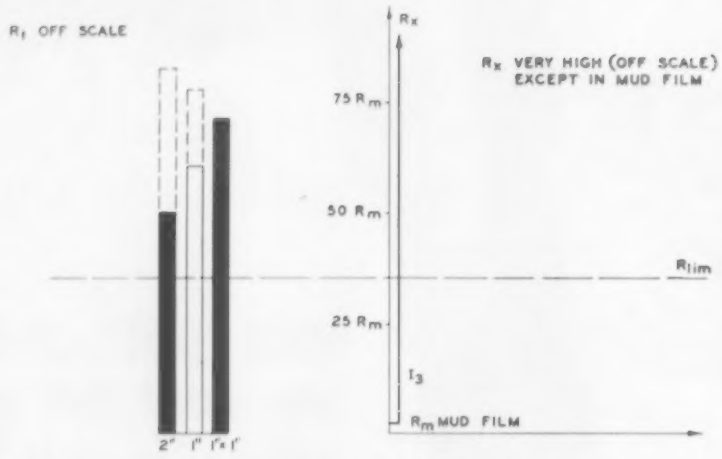

Fig. 1—Impervious bed of high resistance.

Impervious Beds of Low Resistivity (Cases I_2 and I_3)

Fig. 2 shows an impervious bed of low resistivity $R_t = 3\ R_m$, as for example a shale. The resistivity diagram on the right of the figure shows that the resistivity is uniform and does not vary with the distance from the pad.

The rectangles at the left show the values which would be recorded with different spacings, and the true resistivity. The apparent resistivities are equal but slightly lower than R_t because of the limited dimensions of the pad.

When the resistivity of the impervious bed is not much different from that of the mud, there is practically no separation between the microresistivity curves (Case I_3). When, on the contrary the resistivity is much higher than that of the mud, the long spacing, 2-in., will usually give lower values than the short spacing, 1 by 1 in. This is because of the effects of the mud film and of the limited size of the pads used. When the long spacing gives lower values than the shorter spacing, the separation between the curves is defined as negative, and this is called Case I_2. Other conditions which may give rise to negative separation will be considered later.

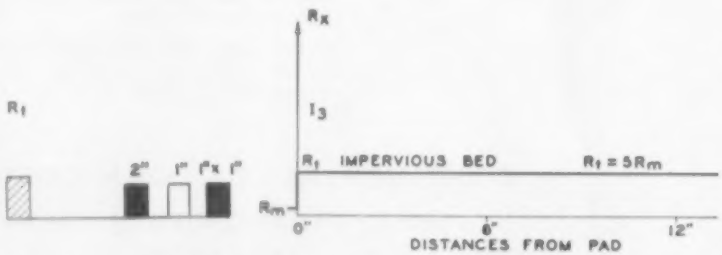

Fig. 2—Impervious bed of low resistance. (Both figures here from Doll, "The MicroLog . . .," Trans. A.I.M.E., Vol. 189, 1950).

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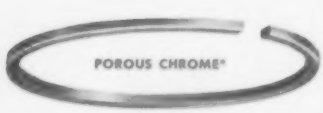

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Applying Spectroscopy in Petroleum Analysis—1

by R. C. Pomatti, R. F. Meeker, and Harry Levin

ALTHOUGH the principles of spectroscopy have been known for about 100 years, the petroleum industry has applied this science to its analytical problems only in the last 15 to 20 years. The two main reasons for this were: (1) petroleum products in general do not lend themselves directly to certain types of spectrochemical analysis and (2) there was a lack of commercially available instruments with which to do spectroscopic work. With the development of various techniques and instruments, the picture has changed. Many analytical problems encountered in petroleum laboratories are solved by spectroscopic methods.

Due to limited space, we shall discuss only certain aspects of the two main types of spectroscopic methods —absorption and emission.

Radiant energy . . . In using the techniques of spectroscopy, we are concerned with the relationships that exist between radiant energy and matter. This radiant energy, which is electromagnetic in nature, is transmitted in the form of waves having various intensities and whose wave length is given by the fundamental relationship: $\lambda = C/\nu$, where λ is the wave length of the radiation, ν is the frequency of vibration, and C is a universal constant, velocity of light.

Fig. 1 shows the distribution of this radiant energy from the short gamma rays to the long radio waves. Our interest will center around the ultraviolet and infrared regions.

Briefly, in absorption spectroscopy, we measure wave lengths and intensities of radiation absorbed on passing through matter, whereas in emission spectroscopy, the radiation emitted by atoms and molecules is studied.

Absorption . . . Let us first consider absorption methods. These have wide applications in a petroleum laboratory dealing chiefly with organic chemistry in the identification of compounds, in the control of organic synthesis and purification procedures, in the determination of molecular structure, and in the qualitative and quantitative analysis of essentially organic materials—crude oils, lubricating oils, greases, and gasolines. Absorption methods are used to detect and determine organic impurities, additives, etc., present in petroleum products. In conjunction with other techniques, for example fractional distillation, they serve to determine numerous individual compounds in gasoline and other fractions.

The basis of absorption spectroscopy is the fact that each organic compound has its own unique or characteristic wave-length absorption pattern. Because the absorption spectrum of a compound is directly related to its chemical structure, no two compounds of different chemical structure can possibly have the same absorption spectrum.

The two main portions of the electromagnetic spectrum used in absorption analysis are the ultraviolet and infrared regions. In the ultraviolet region, aromatic compounds and certain diolefins have specific absorption bands useful for analysis. All organic compounds absorb selectively in the infrared region, making it more versatile for absorption studies than the ultraviolet one.

An absorption spectrogram is usually obtained with an instrument called a spectrometer or a spectrophotometer. (Fig. 2 shows a schematic diagram of an idealized instrument). It consists of a source rich in radiation of that part of the spectrum we want to use for our analysis; a dispersing element and slit system to sort the wave lengths that individually fall on the sample which can be a gas, solid, or liquid; a sample holder; and a detecting and recording system.

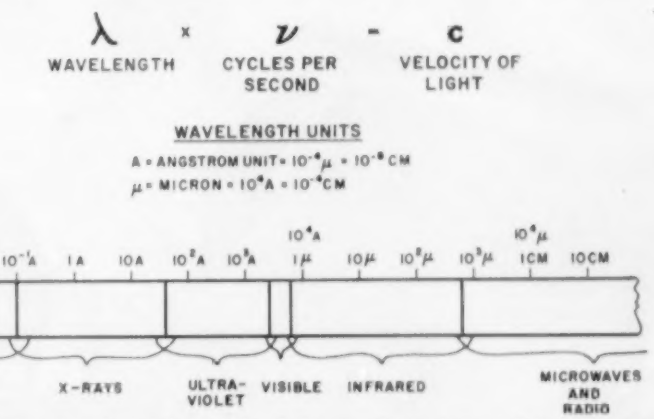

Fig. 1—The two main portions of the electromagnetic spectrum used in absorption analysis are the ultraviolet and infrared regions.

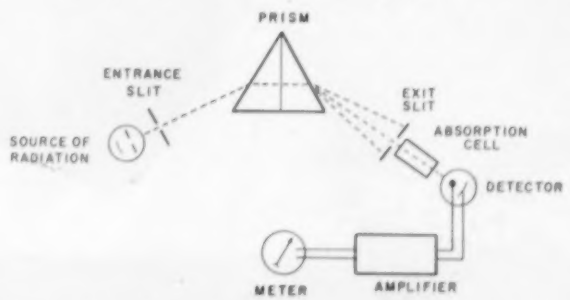

Fig. 2—Schematic diagram indicating operating principle of a spectrophotometer.

Authors are with The Texas Co., Beacon Laboratories, Beacon, N. Y.

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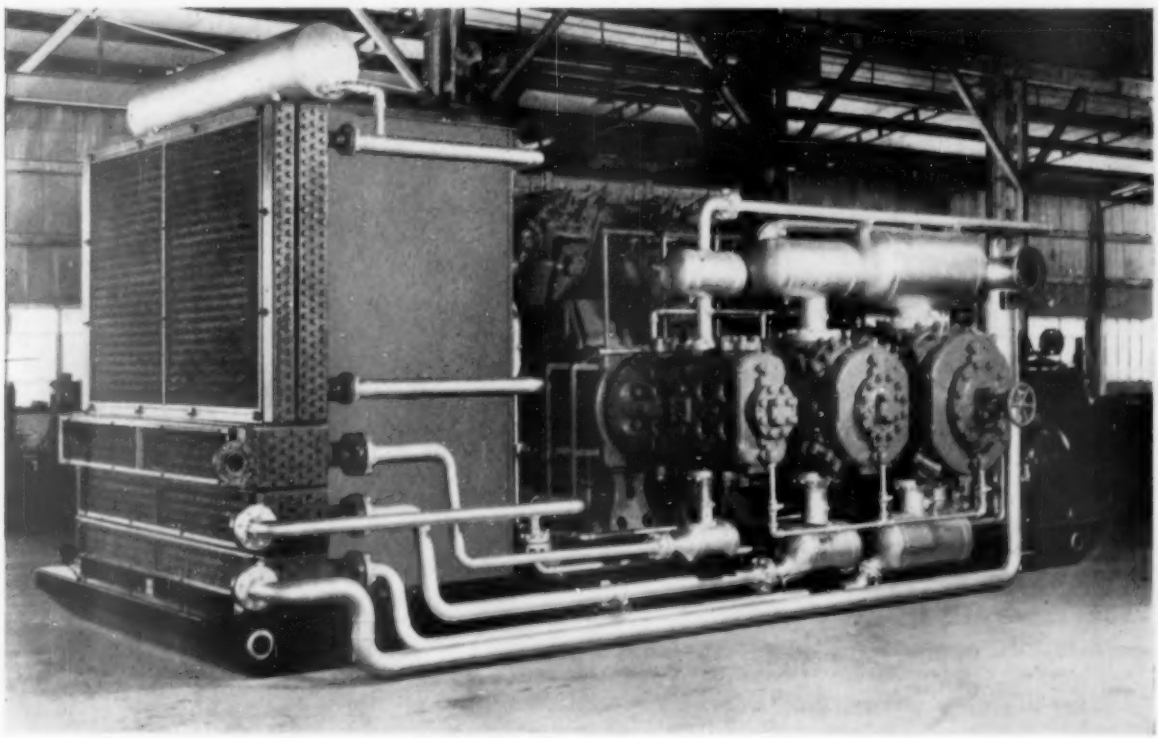

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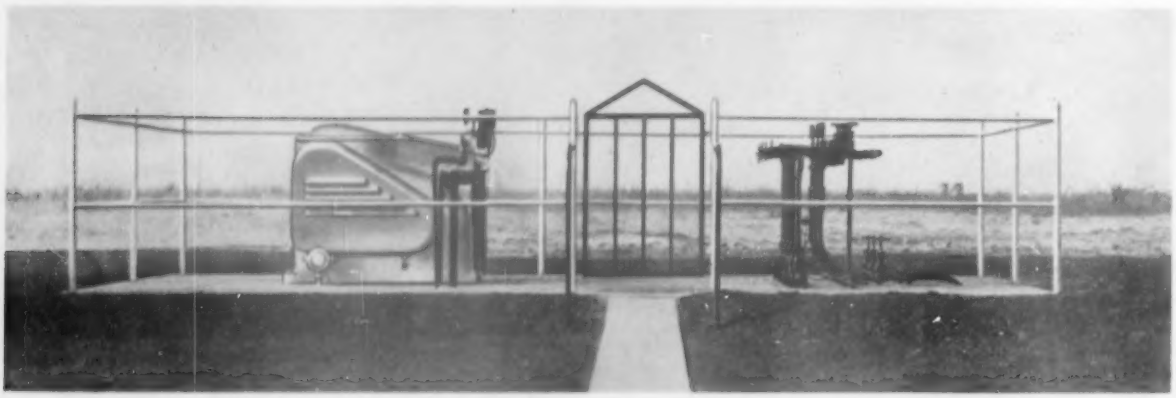
Gaulin Triplex Pumps now at work in the oil fields are proving their design advantages every day. Gaulins offer a good combination of easy operation and low maintenance costs.



Some of the features of Gaulin Triplex Pumps. . .

Horizontal design completely separates cylinder from crankcase, preventing any product leakage to crankcase.

Plexiglas well covers give an instant visual check of cylinder plunger and packing operation.

Spring-loaded plunger packing is self-adjusting, self-sealing, eliminating the human element.

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Corrosion-proof cylinder . . . and all parts contacting your product are made of stainless. Hardened stainless or ceramic plungers available.

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See the GAULIN TRIPLEX PUMP *October 14-17, Permian Basin Oil Show, Odessa, Texas*

Finding Sweep Efficiency in Pattern Floods

by Dr. Ralph F. Nielsen

WATER and oil production after the first appearance of water in a pattern flood is governed by a number of factors. In previous numbers, it has been shown how relative permeabilities and viscosities affect saturation distribution in the flooded area behind the front. It has been shown how an estimate may be made of the average saturation in the flooded area. Also, the water and oil production from the flooded area after water breakthrough may be estimated. The method of estimation involves a plot of fractional water flow at any point, based on viscosities and relative permeabilities, against saturation at that point. The estimates are made from slopes and intercepts of tangents to the curve, the same values applying, theoretically, to linear and radial flow.

The above constitute only one of the factors governing water and oil production after injected water appears at the producing well. Often a heterogeneous permeability profile largely governs the water-oil ratio history. Calculations for such a condition have, in general, been based on the method of parallel reservoirs.

The setting up of saturation gradients due to the effect of saturation on capillary pressure constitutes a factor affecting flooding efficiency which is difficult to evaluate from theory. When the boundary between oil bank and flooded zone is perpendicular to the flow direction, some estimate of the extent of the so-called capillarity zone, or area of transition from oil bank to flooded zone, may be made. However, in the relatively dead areas between injection wells, the extent of such capillarity zones and their effect on the oil and water production histories cannot easily be evaluated.

Finally, the "sweep pattern" and "sweep efficiency," that is, the shape and extent of the flooded area and their change with time, affect the oil and water production. For the sake of continuity, the theory will be reviewed briefly here.

Author is associate professor, petroleum and natural-gas engineering, Pennsylvania State University.

Fig. 1 shows streamlines and equipotential lines for single-fluid flow in an idealized five-spot. The full lines show a fluid "front," or movement of a boundary between the fluid injected after a certain time and that previously injected. This boundary will be circular at first. Later, however, the boundary in direct line from input to producer gets into a zone of higher-pressure gradient (greater proximity of the equipotential lines) than the boundary which must travel a more indirect route. Fluid in the direct line thus gets quite a boost in the halfway section.

Shape of the front at various times may be found by determining how far it has traveled along the several streamlines. The linear velocity at any time is:

$$\frac{ds}{dt} = -\frac{K}{\mu f}\frac{dp}{ds} \qquad (1)$$

where s is distance along the streamline, t is time, K is permeability, μ is viscosity, and f is fractional porosity in usual units. Time required to travel a distance S from the center of the input well is, therefore:

$$T = \frac{\mu f}{K}\int_{r_w}^{S}\frac{ds}{dp/ds} \qquad (2)$$

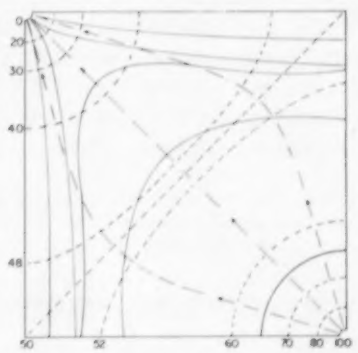


Fig. 1—Equipotential lines (short dashes), streamlines (long dashes), and fluid front (full lines) for single-fluid flow in a five-spot.

The integral may be evaluated from the area under a plot of s (as abscissa) against 1/(dp/ds), areas being taken out to any desired value S measured along the streamline in question. Values of the gradient as a function of s may be obtained by first plotting p against distance on the streamline and differentiating graphically.

The part of the imaginary boundary which travels in direct line from input to producer has a double advantage over that which travels a more curved path. Not only is measured distance s shorter, but pressure gradients are higher in the middle area between input and producer. The front, therefore, forms a sharp cusp, as shown.

Fractional area of the five-spot behind the front, just as the cusp reaches the producing well, may be called the single-fluid sweep efficiency. Thus, Equation 2 may be used along the direct line from input to producer to find time required for the cusp to reach the producer. From the five-spot formula, total fluid injected in that time is calculated and compared with the total pore volume of the square. Muskat[1] found this sweep efficiency to be about 71 per cent.

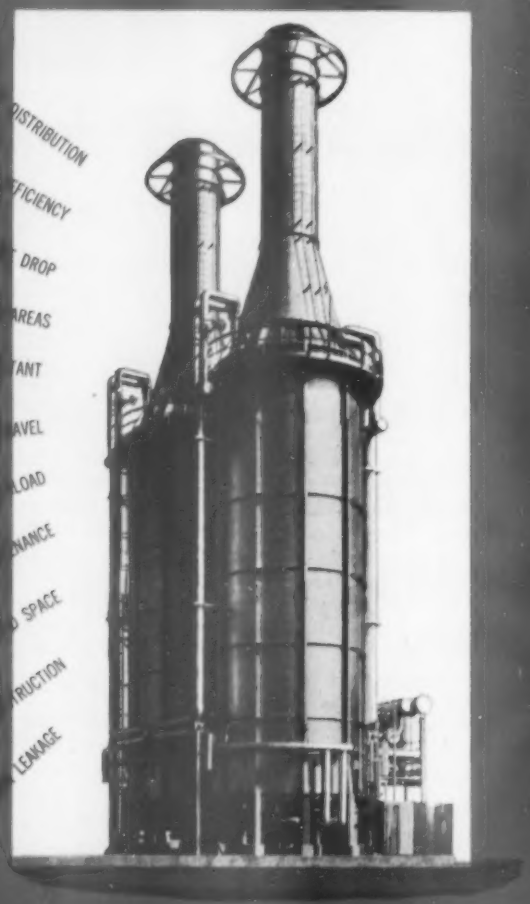
The shape of and area subtended by the boundary at any later time after the cusp has reached the producer may be found by applying Equation 2 to the various curved streamlines. If the fluid ahead of the front were oil and that behind the front were water of the same viscosity, displacing it completely, then the change in swept area over a time increment would be the oil produced. Total injected water in the same time would be given by the usual formula. The difference would be produced water.

If viscosities and effective permeabilities are not the same ahead of and behind the front, the sweep efficiency will not be that calculated for single-fluid flow.

Reference

1. Muskat, Physical Principles of Oil Production, McGraw-Hill.

If yours is a fluid heating problem



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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Loss From Diesel-Fuel Tanks and Accumulation of Water

"What are normal losses from underground diesel fuel oil tanks and what is the tendency toward condensation of moisture?"—H. J. R.

Probably no literature is available on this specific question because the losses are extremely low or negligible and because the tendency toward condensation of moisture is entirely a function of the environmental conditions. With respect to the condensation of moisture, only the few questions answered on this page are known to this department and it is doubted that any other literature is available. Although these four items do not pertain directly to diesel fuels, they supply the general information required for the estimation of the amount of condensation:

1. Nelson, W. L., Solubility of Water in Oils, The Oil and Gas Journal, August 19, 1943, p. 68.
2. Nelson, W. L., Petroleum Refinery Engineering, 3rd Ed., p. 171 (Stability of Water in Oils), McGraw-Hill Book Co., Inc., N. Y., 1949.
3. Nelson, W. L., Water in Underground Storage Tanks, The Oil and Gas Journal, September 2, 1949, p. 50.
4. Nelson, W. L., Water in Gasoline Tank, The Oil and Gas Journal, December 1, 1945, p. 75.

Water can arrive in an underground storage tank in only three ways, barring, of course, the delivery of water into the tank along with the fuel oil:

1. Leaks.

2. From air. Moist, warm air carries moisture into the tank as it is being emptied or during the breathing caused by temperature changes. As the air cools, moisture condenses mainly as droplets on the roof of the tank. For such condensation to occur, a high air humidity and a relatively large temperature difference between the air and the ground (or tank) temperature is necessary.

3. Dissolved in fuel. The solubility of water in oil is not large but such water as is dissolved in the oil will be precipitated if the tank temperature is lower than the filling temperature.

Little can be done in the way of computations because of the humidity and the daily or seasonal changes in ground temperature are seldom known. However, the change in temperature is very small in buried tanks and this minimizes the condensation of moisture drawn in with the air. During the emptying of 1,000 cu. ft. (7,480 gal.) of liquid, it would be possible to introduce 1 lb. or more of water with the air if the temperature of the air were reduced from 90° to 50° F. Likewise, about 6 lb. of water would be deposited as 7,480 gal. of fuel was introduced and cooled from 90° to 50° F.

Losses by evaporation occur mainly by breathing and during filling. Again, breathing is minimized in an underground tank. Finally, the vapor pressure of diesel fuels having a flash point of 100° F. is only about 10 mm. (Nelson, W. L., Estimating Flash Point, The Oil and Gas Journal, October 13, 1949, p. 125) at 100° F. or about 0.2 psia. At a tank temperature of 70° F. the vapor pressure is only about 3 mm. Thus, due to the low vapor pressure alone and without regard to the very small amount of breathing in such a tank, the losses by evaporation should be only about one-sixtieth of the losses from conventional aboveground crude-oil tanks, or even one hundred and fifty-fifth of the losses from fixed-roof aboveground gasoline tanks. Although these estimates may not be precise, it is certain that evaporation losses will be very small.

Heating Value Governed by Gravity

"Our furnace oil that is used in home-heating furnaces has a gravity test of about 37°. Our crude oil, that is, the natural crude that comes from the wells, also has a test of 37° (A.P.I.). Can you tell me the number of heat units or B.t.u.'s per gallon in the two oils?" J.A.B.

The heating values of the crude oil and the furnace oils are for practical purposes the same, namely about 19,600 B.t.u. per pound or 137,000 B.t.u. per gallon (gross or higher heating value).

Note, however, that crude oil would be extremely dangerous if used as a fuel in a furnace, and in fact, it would be dangerous in the storage tank. The crude oil would have a flash point (or inflammability temperature) below about 50° F., meaning it would catch on fire if exposed to a flame or spark at room temperatures and lower, whereas the furnace oil would not ignite unless it was heated to 160° F., or higher in temperature.

Conductivity of Refinery Insulation

"What are the conductivities of the common refinery insulation materials?"—M.N.R.

Table 1 shows conductivities as a function of the average temperature.

TABLE 1—THERMAL CONDUCTIVITIES OF INSULATION MATERIALS
(Conductivity, B.t.u. per hour per square foot per inch thickness)

Temp. (°F.)	Rock wool blanket*	85% magnesia	Superex†	Hi-Temp No. 12‡	Standard Uni-bestos§	Super Uni-bestos§	Vermiculite	Mineral wool insulating cement¶
200	0.41	0.45	0.65	0.61	0.38		0.53	0.7
400	0.53	0.51	0.69	0.67	0.48		0.62	0.8
600	0.65		0.73	0.73	0.59	0.61	0.72	0.9
800			0.77	0.79		0.71	0.82	1.0
1,000			0.82	0.86		0.81	0.91	
1,200			0.88	0.92			1.01	

*Comm. Stds. CS-117-44 Class C. †Johns-Manville. ‡Phillip Carey. §Union Asbestos Co. ¶Comm. Stds. CS-117-44 Classes C and E.

AN ECONOMY FACTOR IN REFINERY OPERATION

Proved long life and stubborn resistance to corrosion make cast iron pipe a contributing factor in lowering plant maintenance per barrel of crude. Replacing shorter-lived pipe with cast iron pipe has demonstrated this in many refineries. Cost per term of service decreases. Interference with production, caused by frequent replacements, ceases to be a headache. Cast iron pipe works hand-in-glove with plant management to keep maintenance cost down in many refinery operations. Available with bell-and-spigot, plain end and flanged, or with standardized mechanical joints. Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 1015 Peoples Gas Bldg., Chicago 3, Illinois.

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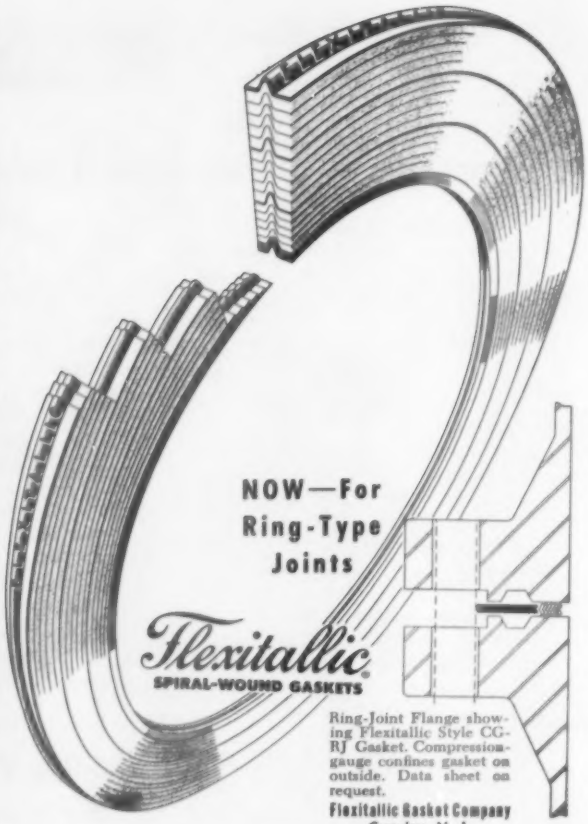
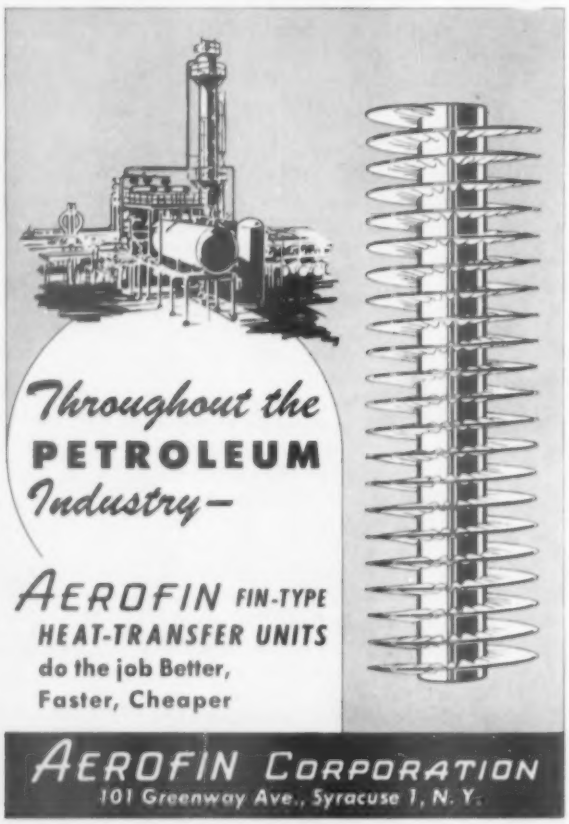
FOR LONG LIFE AND ECONOMY



Ring-Joint Flange showing Flexitallic Style CG-RJ Gasket. Compression-gauge confines gasket on outside. Data sheet on request.

Flexitallic Gasket Company
Camden, N. J.



AEROFIN CORPORATION
101 Greenway Ave., Syracuse 1, N. Y.

by W. L. Nelson
Technical Editor

COST-imating

Increased Wages Threaten to Increase Construction Cost

WHEN our economy functions properly, wages should increase always at a rate slightly exceeding the rate at which materials increase in price. There was evidence in April of this year that such a proper balance was being established but since that date, wages have again risen at a rate that threatens to cause construction costs to rise—a further inflation. The cost of construction materials has remained constant but the cost of construction labor has increased by over 2 per cent.

The cost indexes on this page may be used to bring the prices of the Cost-imating Series (October 21, 1948-December 29, 1949) to current prices. Similar itemized cost indexes are published each quarter in the first weekly issues of January, April, July, and October. In addition, the Refinery Construction Index appears in the first issue each month on the Refining Page.

Itemized Cost Indexes

(Multiply the 1946 prices of the Cost-imating Series by these Index Numbers divided by 100.)

	1948	1950	1951	1952	1953	1954 June	References*	Index for earlier years (The Oil and Gas Journal unless noted) in Cost-imating issues
Labor:								
Skilled construction	125.0	140.0	148.3	157.9	167.3	174.1	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	131.0	148.1	156.8	168.2	181.2	192.0	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	128.0	144.0	152.5	163.1	174.2	183.0		No. 61—Dec. 15, 1949
Refinery operation	126.0	137.6	149.1	155.1	165.2	172.0	Sur. of Current Business	No. 55—Nov. 3, 1949
Equipment or materials:*								
Arc welding machinery	....	....	....	151.3	154.7	157.5	Code ‡11-76	
Boilers, tanks and sheet metal	†140.0	†136.0	†156.1	†153.4	†150.3	146.9	Code 10-72	April 21, 1952§
Boiler tubes, 2-2¼ in.	†135.0	149.5	163.3	168.8	186.3	196.2	Code 10-14-61	
Building materials (nonmetallic)	147.1	154.8	164.3	164.4	171.1	172.2	Code‡ 13	No. 23—Mar. 17, 1949
Brick—building	122.8	133.5	141.2	140.6	142.8	144.5	Code 13-41	No. 20—Mar. 3, 1949
Brick—fireclay	133.3	153.4	165.3	167.1	181.8	190.2	Code 13-42	
Castings (foundry products)	144.6	152.9	167.2	168.0	176.8	181.1	Code 10-15	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	121.3	134.6	145.2	145.8	153.1	157.7	Code 13-4	No. 20—Mar. 3, 1949
Concrete—ingredients	119.4	125.3	132.7	132.7	137.8	140.9	Code 13-2	No. 23—Mar. 17, 1949
Concrete—products	118.9	124.4	132.8	132.6	135.9	138.5	Code 13-3	
Electrical machinery	127.6	134.9	154.3	152.4	156.4	159.5	Code‡ 11-7	See Marshall-S. (below)
Electrical motors and generators	128.6	135.0	155.8	154.6	157.1	158.2	Code‡ 11-73	No. 31—May 19, 1949
Electrical switchgear	....	....	....	161.4	165.0	171.2	Code ‡11.75	
Electrical transformers, etc.	127.0	131.6	147.7	148.0	156.9	161.9	Code‡ 11-74	No. 31—May 19, 1949
Engines (composite)	116.9	126.0	146.1	146.5	148.1	150.6	Code‡ 11-54	No. 36—June 23, 1949
Exchangers	130.0	140.0	152.0	165.8	174.9	175.9	Manufacturer	No. 3—Oct. 28, 1948
Fans and blowers	131.3	162.9	190.1	183.7	185.5	192.6	Code 11-47	Feb. 17, 1949§
Hand tools	125.2	143.2	154.2	155.1	165.4	172.1	Code 10-42	
Instruments (composite)	120.0	127.8	142.3	143.2	151.9	153.9	Manufacturer	No. 34—June 9, 1949
Flow meter (mechanical)	....	114.0	126.8	132.3	147.8	160.5	Manufacturer	No. 34—June 9, 1949
Flow meter (air control)	....	138.5	157.6	160.5	170.4	178.8	Manufacturer	No. 34—June 9, 1949
Flow meter (remote)	....	135.5	151.7	155.2	151.5	146.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point	....	134.0	146.6	151.5	157.8	162.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control	....	134.1	136.8	144.9	152.6	148.6	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder	....	135.6	153.3	158.4	163.7	166.3	Manufacturer	No. 34—June 9, 1949
Pressure gage	....	101.2	108.6	108.6	108.6	108.6	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)	....	124.0	144.3	149.4	152.6	152.3	Manufacturer	No. 34—June 9, 1949
Control Valve	....	133.3	155.5	156.5	162.5	162.0	Manufacturer	No. 34—June 9, 1949
Insulation materials	126.8	125.0	128.8	130.4	133.5	136.1	Code 13-72	
Lumber (composite)	181.0	193.0	208.5	203.2	201.1	194.6	Code 8-1	No. 7—Dec. 2, 1948
Lumber (Southern Pine)	174.3	176.9	189.1	191.2	189.6	175.8	Code 8-12	No. 7—Dec. 2, 1948
Lumber (other soft woods)	206.5	230.2	252.7	248.5	256.8	250.6	Code 8-13	
Machinery—general purposes	124.9	136.7	153.0	151.8	155.1	158.7	Code 11-4	Feb. 7, 1949§
Machinery—construction	127.8	140.1	155.3	157.5	162.3	165.2	Code 11-2	
Machinery—oil field	†125.9	†135.8	†149.6	†149.9	†156.3	161.4	Code 11-51	
Paints—prepared	141.4	140.0	153.8	155.7	156.7	159.0	Code 6-21	
Pipe, sewer	†119.1	†129.9	†147.1	†146.6	†150.6	151.6	Code 13-45	No. 22—Mar. 17, 1949
Pumps, air compressors, etc.	127.0	138.2	155.9	155.6	162.5	166.6	Code‡ 11-41	No. 29—May 5, 1949
Steel (iron and steel)	141.1	152.9	166.7	168.5	177.4	178.1	Code 10-1	No. 61—Dec. 15, 1949
Steel—finished steel	160.4	182.6	196.9	201.2	216.6	222.9	Code 10-14	
Steel—plate and sheet		(See boilers, tanks, etc., above)						
Steel—structural shapes	145.0	162.7	172.6	179.1	188.8	193.0	Code ‡10-14-31	No. 18—Feb. 17, 1949
Valves and fittings	†125.9	†135.8	....	¶190.8	193.1	197.9	Code‡ 11-49 (1-6 & 11-14)	No. 46—Sept. 1, 1949
Marshall-Stevens equipment (only) indexes:								
Chemical	130.0	133.8	142.5	142.8	144.4	147.1	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Petroleum	132.0	136.5	145.6	146.0	147.8	150.7	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Electrical power	135.0	139.3	148.3	148.7	150.5	153.4	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Refrigeration	141.0	147.3	159.2	159.7	161.2	163.2	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Steam power	132.0	136.6	146.5	147.0	148.8	151.6	Chem. Eng. Dec. 1953	Chem. Eng. Feb. 1951
Nelson Refinery Construction	132.5	146.2	157.2	163.6	173.5	179.2		No. 61—Dec. 15, 1949

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Estimated base value for 1946. ‡Not exactly the same items as those published before July 7, 1952. §Questions on Technology, The Oil and Gas Journal. ¶Revised.

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Pipeline Patrol

...Report on Construction

Operation Big Bog

CONSTRUCTION of Cities Service Pipe Line Co.'s new 12-in. line from Fauna tank farm, near Houston, to Sour Lake, Tex., became an operation through a sea of mud in the swampy woodland near Sour Lake. This large area, locally known as the "Big Thicket," has very few access roads and consequently, for many miles the construction equipment must travel the pipeline right-of-way.

The new line, having a capacity of 65,000 bbl. per day, was placed in operation in August and will deliver into Cities Service's 20-in. line from Sour Lake to Lake Charles, La.

Under Way, Contracted, and Planned

PIPELINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipeline companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the job.

Crude-Oil Pipelines

Arapahoe Pipe Line Co.—This company owned jointly by Sinclair and Pure has let contracts on a 494-mile crude line from Merino, Colo., to Humboldt, Kans. The contracts were let in the following sections:

Section 2.—162 miles of 18-in. from Colby to Schurr Station, Kans., R. H. Fulton.

Section 3.—84 miles of 20-in. from Schurr Station to Burns, Kans., R. H. Fulton.

Section 4.—86 miles of 20-in. from Burns to Humboldt, Panama Williams Co.

Ar-Mex Pipe Line Co.—Company has applications for two lines before the Office of Defense Mobilization Board for rapid amortization approval.

1. A crude-oil line from Albuquerque, N. M., to Phoenix, Ariz. This line would serve a 20,000-bbl. refinery being planned by Frost & Associates of Dallas.

2. A crude-oil line from Guernsey, Wyo., to Albuquerque.

• **California-Oregon Pipe Line System.**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

Continental Pipe Line Co.—Has awarded contract to G. G. Griffis Construction Co. to build 64-mile, 12-in. crude line from Oklahoma City to Ogg Station near Tonkawa, Okla. The line will give Conoco a complete 12-in. system between Wichita Falls, Tex., and the company's Ponca City, Okla., refinery.

Interstate Oil Pipe Line Co.—Company will build 32 miles of 8-in. crude line from Gwinville field of Jefferson Davis County, Mississippi, to the Soso field in the tri-county area of Jones, Jasper, and Smith counties, Mississippi. Completion set for December 1.

Magnolia Petroleum Co.—This company will operate a 48-mile, 12-in. submarine pipeline for itself and Continental Oil Co., and Newmont Oil Co. The line will run to blocks off the coast of St. Mary's Parish, Louisiana, and will have a capacity of 50,000 bbl. per day. Brown & Root, Houston, has the contract and expects to be finished by the middle of 1955.

Minnesota Pipe Line Co.—Williams Brothers Co. has contract to build this 260-mile, 16-in. crude line from Clearbrook to Hastings, Minn. The line, to cost $12,500,000, is the southern end of a system which will

See Composite and Refinery Catalogs, or Write for Folder On

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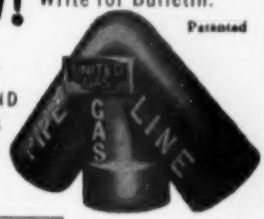

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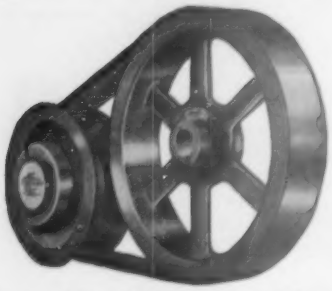

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Pipeline Patrol

move crude from Fosterton field, Sask., to Great Northern's refinery which is building in the Minneapolis-St. Paul area. Present plans call for completion by July 1955.

• **NNCW Pipeline Co.**—127-mile line, proposed, from Weston County, Wyoming, to Casper. 108 miles of 10-in. and 19 miles of 8-in. Est. cost: $3,500,000.

Shell Pipe Line Corp. — Company has awarded Anderson Bros. Corp. a contract to lay 35 miles of 12-in. crude line from Cabin Creek field in Montana to a tank-car loading rack on the Northern Pacific Railroad near Glendive, Mont.

Standard Pipe Line Co.—Company plans to build two crude lines. Applications are now before the Office of Defense Mobilization for rapid amortization approval.

1. A 350-mile, 16-in. crude line from Glendive, Mont., to Guernsey, Wyo., to connect with Platte Pipe Line Co.'s system there.

2. A 330-mile, 16-in. crude line from Wink, Tex., to Albuquerque, N. M. This line would serve a 10,000-bbl. refinery being planned by Frost & Associates of Dallas.

• **Union Oil Co. of California.**—Planning construction of a 60-mile crude line from its Clara Valley field to its Wilmington refinery. Line is expected to be completed by late this year. Size not yet determined. Engineering work under way.

Western Pipe Line Co.—This subsidiary of Service Pipe Line Co. has let contracts for 630 miles of 20, 22, and 24-in. crude line from Fort Laramie, Wyo., to Freeman, Mo. The western section of the line will be laid by H. B. Zachry Co. and the eastern section will be constructed by O. R. Burden Construction Corp. Completion set for December 1.

Products Pipelines

• **American Pipe Line Co.**—Has received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line to run from Gulf Coast area to New York City area. Bids for pipe requested.

Badger Pipe Line Co.—Company to build 195 miles of 8-10-12-in. pipeline from East Chicago, Ind., to Madison, Wis. One section of 40 miles has been let to Morrison Construction Co. of Hammond, Ind.

• **H. W. Bass & Sons, Inc.**—152 miles, 4-6-in., proposed. Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

Cherokee Pipe Line Co.—Company will convert a recently purchased crude line into an aviation and jet fuel carrier from Ponca City, Okla., to Wichita. The company also plans to lay about 8 miles of line to complete the present system into Wichita. Line will serve refineries of Continental Oil Co., and Cities Service Oil Co., joint owners of Cherokee.

• **International Pipe Line, Inc.**—132 miles 8-in., proposed, Wrenshall to Minneapolis, Minn. Cost: $4,200,000.

Malco Pipeline, Inc.—Company planning to build a 91-mile, 6-in. products line from its Prewitt, N. M., refinery to Albuquerque.

Moore Stoner Co.—Company has $2,500,000 tax amortization for a 200-mile, 6-in. products line from a connection with Oil Basin Pipe Line Co.'s terminal at Glendive, Mont., to Minot, N. D.

Oil Basin Pipe Line Co.—Midwestern Constructors, Inc., doing the work on this 230 miles of 8-in. products line from Laurel to Glendive, Mont. Cost: $5,350,000.

Phillips Petroleum Co.—Company has let 72 miles of 8-in. line to Somerville Construction Co. of Ada, Mich. Work being done between East St. Louis and Kankakee, Ill. Work to be completed by October 15.

Shell Pipe Line Corp.—65 miles of 12-in. products line from Baton Rouge, La., to Shell's Norco refinery. Houston Contracting Co. has contract. H. T. Muckley, Supt. Job held up indefinitely by right-of-way difficulties.

Standard Oil Co. of Texas.—Company taking bids for the laying of a 248-mile, 6-in. products line from El Paso to Albuquerque. Construction is expected to get under way by October 1. The line will move 5,000-bbl. daily when finished and will cost $4,000,000.

• **Sunflower Pipe Line System.**—Company proposes to build a 215-mile, 6-in. line to transport LPG from six counties in western Kansas to Wichita. Application approved by Kansas Corporation Commission.

Texas Eastern Transmission Corp.—Company has asked FPC permisison to abandon "Little Inch" gas line. If permission is granted, company will spend $71,000,000 converting the line to a products line with a capacity of 235,000-bbl. per day.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles of 8-in. under way from Haines northward through Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Construction Co. are doing the work. Pipe laying will be through by November of 1954; however, entire job not expected to be completed until September of 1955.

Wyoming-Nebraska Pipeline Co.—Houston Contracting Co. has general contract to build 220 miles of 6-in. line from Frontier Oil Co.'s refinery at Cheyenne to North Platte, Nebr. Work expected to be completed by October 1954.

Natural-Gas Pipelines

• **American-Louisiana Pipe Line Co.**—1,121 miles of 30 and 22-in., 30-in., proposed, extends from North Tepetate, Acadia Parish, Loupisiana, to near Detroit. The 22-in. starts near Payne, Ohio, extends to Bridgman, Mich. Estimated cost: $130,000,000.

• **Arkansas Louisiana Gas Co.**—136 miles of new line proposed, to be added to present system in Arkansas, Louisiana, and Texas. Estimated cost: $9,245,166. FPC approved.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, later lines off Transcontinental in North and South Carolina.

• **Central Hudson Gas & Electric Corp.**—Company has filed application with FPC to construct 48 miles of 12-in. line from Albany to Kingston, N. Y. Line will be started and completed in 1955 if FPC approves.

Chicago District Pipe Line Co.—19 miles of 36 and 30-in., completed of 35 miles planned. Remainder, all 30-in., will be completed in 1954.

• **Cities Service Gas Co.**—24 miles of 26-in., planned, to replace two existing 16-in. lines in Franklin and Johnson counties, Kansas. F.P.C. approved.

Nine miles of 20-in. to replace existing 16-in. line in Cherokee and Jasper counties, Missouri. F.P.C. approved.

• **City of Dalton, Ga.**—Proposes to build 39 miles of 8-in. from a point of interconnection with Southern Natural's Rome-Calhoun transmission line. Estimated cost: $2,940,000.

• **City of Fayette, Ala.**—20 miles, 5-in., F.P.C. approved, Fayette, Ala., to Southern Natural's system in Tuscaloosa County, Alabama. Completion set for early 1955.

• **Colorado Interstate Gas Co.**—365 miles, 22-in., approved by F.P.C., Green River, Wyo., to Denver, Colo., 1954.

• **Colorado-Western Pipe Line Co.**—454 miles of undetermined size pipe planned between Cortez in Montezuma County and Denver. Line would serve towns of Montrose, Gunnison, Salida, Fairplay and South Platte, Colo. Estimated cost: $30,000,000. Company also plans 254 miles of laterals to service

Pipeline Patrol

Colorado cities not now receiving natural gas.

328-mile line, proposed, to run from a point in La Plata County in southwestern Colorado over the Continental Divide along the eastern slope to serve Pueblo, Colorado Springs, and Denver. Estimated cost: $21,600,000.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

Gulf Interstate Gas Co.—Company is winding up 860-mile, 30-in. job from Acadia Parish, Louisiana, to Boyd County, Kentucky.

• **Home Gas Co.**—Work under way on 24 miles of 12-in. from Halsey Valley to Westover, N. Y.

Work under way on 25 miles of 12-in. from Port Dickinson to Deposit, N. Y.

• **Hope Natural Gas Co.**—Proposing to build a 22½-mile extension of existing line from Boone County, West Virginia, to Logan-Mingo County line, West Virginia. Estimated cost: $930,000.

• **Houston Texas Gas & Oil Co.**—Company proposes to build three natural gas lines. One line would run from lower Rio Grande Valley to Chicago. The other line would go from southern Louisiana to New York City. Third line would run from Louisiana to Florida., 20, 24, 30-in., pipe considered in plans. Engineering firm reported preparing an economic report on the lines at present.

• **Iroquois Gas Corp. and Tennessee Gas Transmission Co.**—Companies planning joint storage project to be known as Colden storage field in New York. The following delivery and gathering lines are planned:

17 miles, 16-in. delivery line.

62 miles, 12, 8, 6, and 4-in. gathering lines.

• **Iroquois Gas Corp.**—25 miles of 20-in. line, approved by FPC, from Iroquois' Porterville station near Elma, N. Y., to Tonawanda, N. Y. Est. cost: $1,540,000.

• **Kansas-Nebraska Natural Gas Co., Inc.** Proposes to construct 206 miles of 6-12-in. pipeline to add to present system in central and northeastern Nebraska.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., Doddridge, Wetzel and Marshall counties, West Virginia. Fulghum Contracting Co. doing work.

• **Michigan Consolidated Gas Co.**—25 miles, 12-in., proposed, from near Sparta to Muskegon, Mich.

• **Michigan Wisconsin Pipe Line Co.**—251 miles, proposed, 24, 18, 12, 6, and 4-in. loops. Majority will be in Wisconsin.

Mid-South Gas Co.—Engineering Construction Co. of Tulsa has contract for 50 miles of various size pipe from Marion to Truman, Ark.

• **Missouri Central Gas Co.**—25 miles, 6-in., proposed, Moberly to Macon, Mo.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo. FPC approved. Est. cost: $600,000.

• **Montana-Dakota Utilities Co.**—Proposes to build 56 miles of 2, 4, and 6-in. line from its 12-in. Cabin Creek-Bismarck line near Gladstone, N. D., to the towns of Lefor, Regent, New England, and Mott, N. D.

• Proposed 34½ miles of 12¾-in. line to run from Baker-Glendive field in Montana to Rapid City, S. D., and 14 miles of 12¾-in. to replace various lines in Park County, Wyoming, and Carbon County, Montana.

• **Natural Gas Producer, Inc.**—100 miles,

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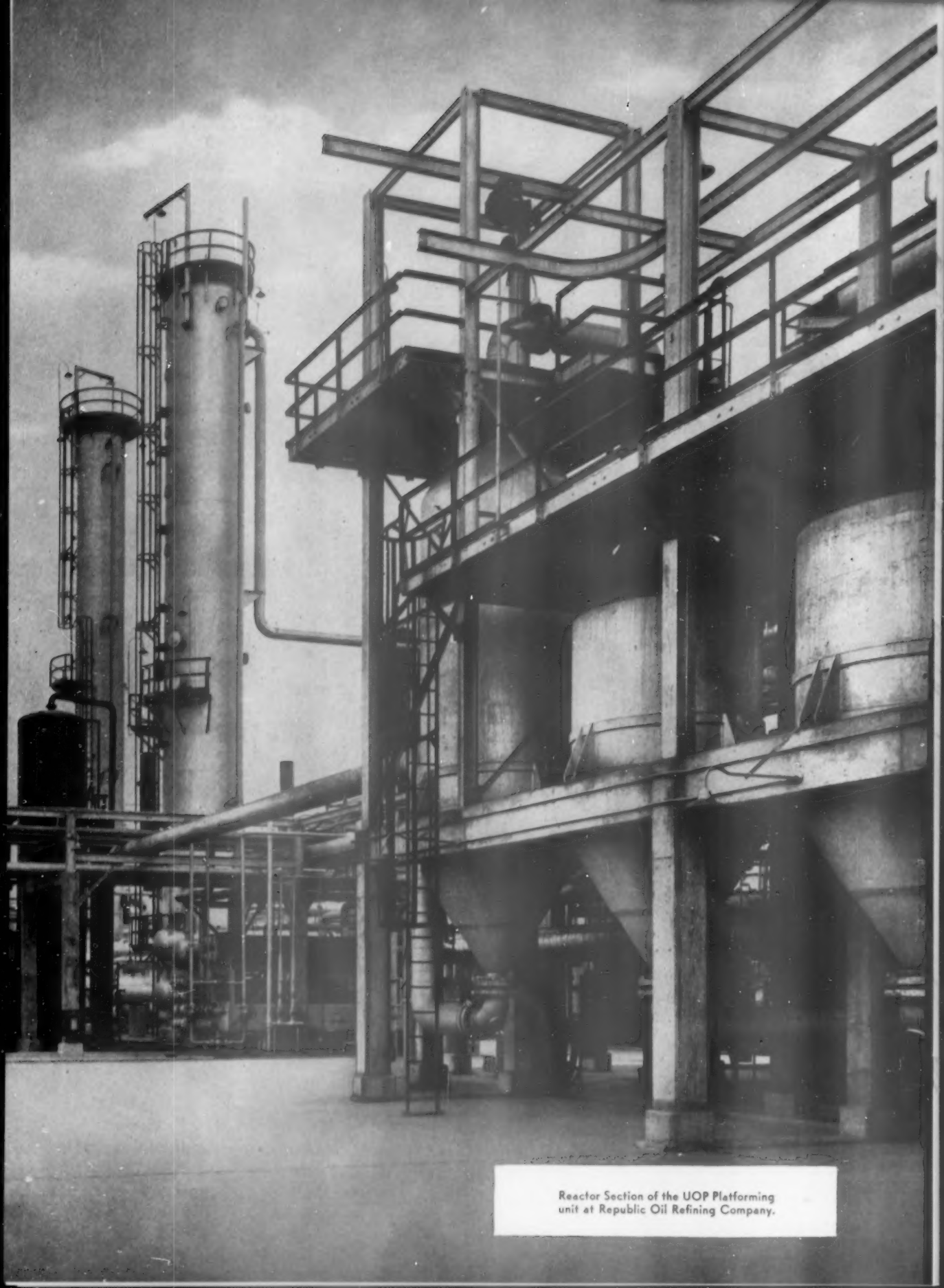


Reactor Section of the UOP Platforming unit at Republic Oil Refining Company.

Platformer Helps Republic To Meet Changing Market Demands Quickly, Economically

By L. W. Robbie
Vice President and General Manager
Republic Oil Refining Co., Texas City, Texas

ADDITION of a UOP Platforming unit to our Texas City refinery has made it possible for Republic Oil Refining Company to quickly fill demands for a variety of products, thus enabling us to easily meet changing market conditions while at the same time deriving the maximum possible profit from the plant's throughput.

L. W. Robbie

The decision to add a catalytic reforming unit to our processing equipment was made only after we took a long-range look at the industry and decided that important changes in octane requirements and public demand for certain petroleum products and by-products would occur. We chose Platforming because:

(A) Careful comparison of other refiners' operating data, and Platforming's long record of commercially proved experience indicated that it was best suited to our anticipated needs.

(B) We felt the simplicity of the Platforming process would assure trouble-free operation and minimum costs.

(C) It would give us flexibility to switch from production of motor fuel to aromatics without costly revamping of equipment.

(D) In addition to increasing octane numbers, the overall quality of our finished gasoline would be improved in other ways.

Can Switch to Aromatics

Now that the Platformer has given us the flexibility that previously was lacking in our refinery operations, we are in a more favorable position to increase octane numbers quickly should the demand swing upward, or we can switch to the production of aromatics at times when market conditions justify.

The 5,500 B/SD Platformer went on stream last November 12, and it has been operating at capacity since then. Catalyst life reached 73.11 barrels of charge per pound of catalyst on the initial run. So far, we have been producing only motor fuel, with the Platformate ranging up to 89 clear octane and 98½ octane after the addition of 3 cc. TEL. The high quality of the Platformate has enabled us to meet with ease the market demands in our trade territory, which call for 87 octane regular gasoline and 95 octane premium motor fuel.

Universal Oil Products Company designed, engineered and licensed the Platformer. Construction of the unit and revamping of some existing refinery equipment was done by Procon Incorporated.

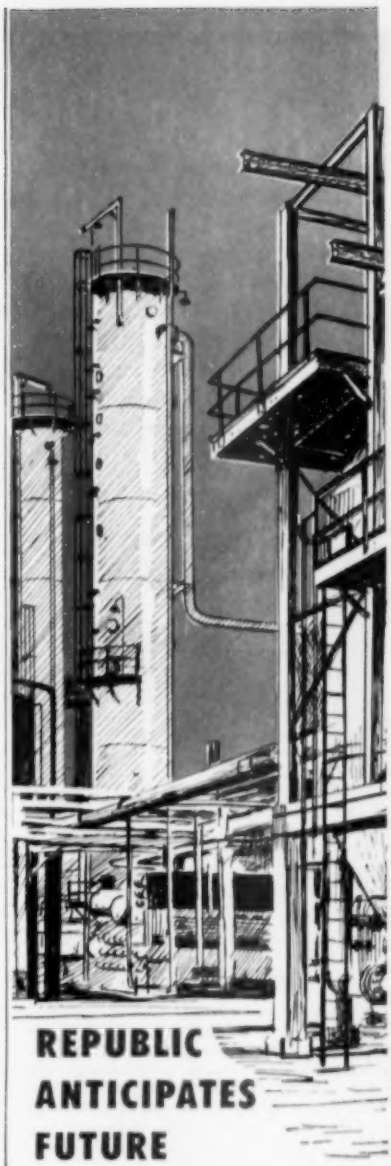
One of the unusual features of the unit is the location of an overhead cooling system for the depentanizer and rerun towers on the roof of an old pump house. The interior of the old pump house was revamped and the Platformer's control panel facilities were placed there. Only one-half of the roof area is occupied by the cooling facilities, thus leaving considerable space for the installation of other equipment should the need arise at some later date for expansion of the unit. A start in this direction was made at the time the Platformer was built by installing a fourth reactor in anticipation of the possible production of aromatics.

21,000 B/SD of Gasoline

Our Texas City refinery can turn out in excess of 21,000 barrels of gasoline per stream day through the combined output of the Platforming unit, a UOP Fluid Catalytic Cracking unit and a UOP polymerization plant. The cat cracker was operated during World War II to produce 100 octane gasoline for the Armed Forces. We conservatively estimate that 85 per cent of our total gasoline production will lead up to more than 95 octane.

Twenty different Gulf Coast sweet crudes are processed in the refinery, which has a throughput capacity of 43,000 B/SD. Charge stock to the Platforming unit boils in the range of 220 to 400° F., and it is a heavy straight run gasoline fraction prepared in a separate fractionation section.

With the installation of the Platforming unit, we have climaxed a long-range program designed to produce the highest quality products which have the broadest marketable range. Our Texas City refinery now is one of the most modern in the country, and the Platformer is playing a vital role in helping us to achieve our goal of making greater volumes of higher quality products from petroleum.



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Pipeline Patrol

12-in., planned, Yenter pool to Denver, Colo.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virgina, to Narrows and Dublin, W. Va.

• **North Dakota Gas Transmission Co.**—470-mile line from Tioga plant of Signal Oil & Gas Co., and Beaver Lodge field to Fargo and Grand Forks, N. D. Line will have 78 miles of 12-in., 215 miles of 10-in., 70 miles of 8-in., and 107 miles of 6-in. Estimated cost: $10,800,000.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

Northern Natural Gas Co.—Midwestern Constructors has finished one job for this company consisting of 5 loops of 94.3 miles of 30-in. line in Texas, Oklahoma, and Kansas.

93½ miles of 20-in. from Ogden to Waterloo, Iowa, being done by Hallmac Construction Co. of Houston.

90 miles of 16-in. from Waterloo to Dubuque, Iowa, being done by Engineering Construction Co. of Tulsa.

54 miles of 16 and 10-in. from Newton to Grinnell, Iowa, has been finished by G. G. Griffis Const. Co. of Tulsa.

24 and 26-in. lines south of Paullina, Iowa, and 20 and 24-in. lines from Paullina to Sioux City being done by R. H. Fulton Co.

Two underwater crossings totalling 5,100 ft. being done by Lone Star Constructors of Dallas.

G. G. Griffis also has 118 miles of 2-12-in. between Rochester and Redwing, Minn., for Northern Natural.

Completion dates not fully determined.

• **Northwest Alabama Gas District.**—40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

• **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.

22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.

23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus; 16 miles, 16-in., planned, Berlin to Sandusky, Ohio.

74 miles, 3 to 20-in., planned, Hocking, Knox., and Ashland counties, Ohio.

47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.

61 miles, planned, northern and southwestern Ohio.

33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.

69 miles, 20-24-in., proposed, lines to tiein Gulf Interstate line along various points in Lawrence, Jackson, Vinton, Hocking, and Fairfield counties, Ohio.

Pacific Gas & Electric Co.—200 miles, 34-in,. planned, paralleling Topock-Milpitas lines. 93 miles completed. 107 miles contracted to Engineers Limited Pipe Line Co. L. E. Robertson is in charge of the spread handling work from Newberry to Danby and from Los Muertos Creek to Gilroy, Calif. Completion November 1954.

15 miles, 20-in., planned for completion in 1955 from Helm Tap to Helm Junction, Calif. Alex Robertson Co.

15 miles, 12-in., planned for completion in 1955. From Herndon to Madera, Calif. Company forces.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash. Approved by FPC.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

Panhandle Eastern Pipe Line Co.—FPC has given this company a temporary certificate to construct 295 miles of 30-in. looping to get additional gas to companies in Illinois, Indiana, Michigan, Ohio, and Missouri before cold weather. The job is costing $22,885,000 and is part of a $66,750,000 expansion program. The remainder of the program calls for $23,580,000 for new compressors and the leaching out of an underground storage cavity near Waverly, Ill., and $11,427,500 for production and gathering facilities improvements in the field.

• **Pine Tree Natural Gas Co.**—204 miles of undetermined size pipe to run from the Boston area to Bangor, Me.

• **Shenandoah Gas Co.**—40 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va. Est. cost: $1,470,000. FPC approved.

• **South Georgia Natural Gas Co.**—368 miles, 2-12-in., planned, Phoenix, Alta., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee. Est. cost: $9,000,000. FPC approved.

• **Southwest Alabama Gas District.**—150 miles, 10 and 8-in., planned, Phoenix City to Dothan, Ala. Engineering Const. Co.

Tennessee Gas Transmission Co.—Company has awarded following contracts on 5.66.8 miles of 30-in. line from Kinder, La., to Portland, Tenn.

98.7 miles from Kinder to U. S. Highway 84 near Jena, La., to Morrison Constructors, Inc.

90.2 miles from U. S. Highway 84 to Louisiana side of Mississippi River to Anderson Brothers Corp.

105 miles from Mississippi River to U. S. Highway 51 near Grenada, Miss., to Houston Contracting Co.

101.6 miles from Grenada to U. S. Highway 45 near Corinth, Miss., to Oklahoma Pipe Line Constructors.

94.9 miles from U. S. Highway 45 to near Centerville, Tenn., to Western Pipe Line Constructors, Inc.

75.6 miles from Centerville to near Portland, Tenn., to Panama-Williams Co.

63 miles, 26-in., under way, loops in Ohio and Pennsylvania. H. C. Price Co.

45 miles, 20-in., proposed, Buffalo, N. Y., to the U. S.-Canadian border near St. Catherines.

243 miles 24-in., planned, Coudersport, Pa., eastward across Pennnsylvania, New Jersey, and New York to point near Greenwich, Conn.

• **Texas Eastern Transmission Corp.**—Proposed 382-mile, 30-in. line from Kosciusko, Miss. to Beaumont, to connect with the existing 30-in. line there to Connellsville and replace the "Little Inch" in moving natural gas.

• Company proposes to build 58 miles of 20 and 16-in. pipeline from Joaquin to Longview, Tex. Cost: $3,269,000. FPC approved.

Texas Eastern Penn-Jersey Transmission Corp.—265 miles, 24-in., approved by the FPC from Oakford Storage field in western Pennsylvania to Texas Eastern Transmission Corp.'s Compressor Station No. 26 near Lambertville, N. J. Est. cost: $30,755.000. Line to be completed November 16.

• **Texas Gas Transmission Corp.**—48 miles, 26-in., planned, loops from Memphis to Slaughters, Ky.

24 miles, 16-in. line planned from North Tepetate field, Acadia Parish, Louisiana, to South Roanoke field in Jefferson Davis Parish, Louisiana. Work to be done in September and October by Houston Contracting.

• **Transcontinental Gas Pipe Line Corp.**—421 miles, 30-36-in., looping along Texas-New York line.

• 19 miles of 12.75-in. pipe starting at West White Lake field in Vermilion Parish,

Pipeline Patrol

Louisiana, and connecting with applicant's transmission line in same parish. Estimated cost: $1,042,310. FPC approval received.

• 57 miles of 36 and 30-in. paralleling sections of its existing system in Louisiana, Mississippi, and Alabama. Approved by FPC. Est. cost: $6,533,000.

• 25 miles of 12-in. in Cameron and Calcasieu parishes, Louisiana, to additional gas reserves. Est. cost: $1,000,000.

• **Trunkline Gas Co.**—Proposes to cross the Mississippi River with two 24-in. lines near Greenville, Miss. Est. cost: $2,960,000.

• **Utah Natural Gas Co.**—Planning 40 miles from Orem to Salt Lake City, 16-in. pipe at later date. Contract not let yet.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Foreign Crude-Oil Pipelines

• **Atlas-Dresser.**—Included in this company's agreement with the Argentine Government are plans to built a 400-mile, 16-in. crude line from Plaza Huincul area to Bahia Blanca.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products). Collins Const. Co. has subbed 84,000 ft. of Sabaqueous work. Shutdown for Monsoon season during summer. Work resumed September 15.

Interprovincial Pipe Line Co. and Lakehead Pipe Line Co.—Contracts have been awarded for 604 miles of looping; 454 miles will be in Canada, the remaining 150 miles will be in the United States.

201 miles of 24-in. between Regina and Gretna, Man., have been awarded to Anderson International Contractors, Ltd., of Edmonton, Alta.

Mannix, Ltd., of Calgary, Alta., will lay 129 miles of 24-in. line between Edmonton and the Alberta-Saskatchewan boundary.

Fulton-Bannister, Ltd., has contract for 125 miles of 24-in. line to connect the lines being built by Anderson and Mannix.

R. H. Fulton & Co., of Lubbock, Tex., has the contract for 104 miles of 26-in. looping from the Canadian border southeast. Anderson Bros. Corp. has contract for 50 miles of 26-in.

South Saskatchewan Pipe Lines, Ltd.—Fulton-Banister, Ltd. has contract to construct 150 miles of 16-in. crude line from Fosterton field in Saskatchewan to a connection with Interprovincial Pipe Line Co.'s system at Regina. Line will have a capacity of 20,000-bbl. per day, will cost $10,000,000 and is expected to be finished by November.

• **Pembina Pipe Line Co., Ltd.**—Company building 325 miles of 3-12-in. gathering line from Pembina field and a 72-mile, 16-in. transmission line to the terminals of Trans Mountain Pipe Line Co., and Interprovincial Pipe Line Co. at Edmonton, Alta.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

• **Petroleos Mexicanos.**—145 miles, 12-in., under way, Jose Colomo to El Plan, Mexico.

Texas Petroleum Co.—Contract has been let to Foster Wheeler Corp. and Panama-Williams for a 119-mile 12-in. crude line to move oil from Velasquez field in Colombia to a connection with the main Andian National system at Galan. Est. cost: $6,000,000.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipelines

Anglo-Iranian Oil Co., Ltd.—18½ miles 16-in., under way, Little Aden to Aden. Bechtel Corp. Completion date December 1954.

18½ miles, 6-in., under way, Little Aden to Aden,. Bechtel Corp. Completion date December 1954.

15 miles, 12-in., under way, Kwinana to Fremantle, M. W. Kellogg Co. Completion date February 1955.

17 miles, 6-in., Kwinana to Fremantle. M. W. Kellogg Co. Completion date February 1955.

• **Empresa Nacional del Petroleo** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

North Atlantic Treaty Organization (NATO).—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line). Contracted by Soc. Foster Wheeler Francaise.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

• **United States Navy Department.**—Proposed 300-500-mile line to be built in Spain to serve a proposed naval base and four large air bases which are also proposed under a defense agreement with the Spanish Government. No definite size or cost is known now.

Foreign Natural-Gas Pipelines

Alberta Gas Trunk Line, Ltd.—This Canadian firm has let engineering c ontracts to two firms, Dutton, Williams Brothers, Ltd., and Mannix, Ltd. for a 300-mile, big inch gas-gathering system to collect Alberta's natural gas for transportation to Trans Canada Pipe Line Co.

Attock Oil Co.—Company plans to build 60-mile natural gas pipeline from Dhulian field to Rawalpindi in West Pakistan.

Azienda Generale Italiana Petroli — 90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

• **Empresa Nacional del Petroleo** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

Petroleos Mexicanos. — 205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

Sui Gas Transmission Co., Ltd.—Morrison-Knudsen Construction Co. has contract to build 350-mile, 16-in. line from Sui field to Karachi in West Pakistan. Est. cost: $25,000,000.

• **Trans-Canada Pipe Lines, Ltd., Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

• **Union Gas Co. of Canada, Ltd.**—Proposed line from Lambton County gas-storage fields to Oakville. Line is being proposed now and will eventually join with proposed line from Alberta to Toronto and Montreal.

Private Interests.—Proposes to build gas line from Gubik gas field near Navy Petroleum Reserve No. 4 in Alaska to Fairbanks. Line would be 450-mile, 8-in. line and Arctic Contractor, Inc., who handled engineering requirements and preliminary design estimated the line would cost $20,000,000, although later figures have been much higher than this.

• **Western Pipe Lines, Ltd.**—Will build 80-mile, 20-in. line from Niagara Falls, N. Y., to Toronto. Gas will be furnished by Tennessee Gas Transmission and taken over in Toronto by Consumers Gas Co. Est. cost: $7,000,000. Canadian Bechtel, Ltd., doing engineering work.

BOOKS

PRELIMINARY OIL AND GAS MAP OF KENTUCKY, 1954. Size 27 by 13 in.; scale, 1:1,000,000; black and white, 25 cents.

PRELIMINARY OIL AND GAS MAP OF KENTUCKY, 1954, with structure contours on Devonian black shale. Size 54 by 26 in.; scale, 1:500,000; black and white with red overprint; contour interval 100 ft. 75 cents.

The preliminary oil and gas map of Kentucky shows the producing oil and gas fields and secondary-recovery projects. It is contoured on top of the Devonian black shale and clearly shows the major structural trends. The producing formations are indicated, and the map will be of use to geologists and operators interested in this area.. These maps may be obtained from Kentucky Geological Survey, 307 Mineral Industries Building, 120 Graham Avenue, Lexington, Ky.

SCIENTIFIC RESEARCHES OF MELLON INSTITUTE, 1953-54. Published by Mellon Institute, 4400 Fifth Avenue, Pittsburgh 13. 56 pp., free on request.

This forty-first annual report of the activities of Mellon Institute outlines the research projects conducted by the institute in the past year. Covering virtually every field of research, the projects included numerous investigations into petroleum properties and product improvements.

PETROLEUM IN VENEZUELA. By Edwin Lieuwen. Published by University of California Press, Berkeley. 160 pp., $2.50.

Essentially an outline history of oil in Venezuela, this book delves into the political and economic aspects underlying the development of Venezuela as the world's second-largest oil-producing nation. The author briefly sketches the background of Venezuelan oil prior to 1899, then goes into a concise analysis of the government policies and oil-company actions that shaped the industry as it exists today. Basically, the author points out, Venezuela's oil industry developed rapidly because the government was extremely liberal in its regulation of oil company activities. This, coupled with fairly low government taxes and royalties, lured major oil companies into Venezuela and rewarded their risks with exceptionally high returns. In recent years, the government has received increasingly larger royalties but it has never demanded the excessive royalties that ultimately discourage company venturing. As a result, Venezuela is now the world's largest oil-exporting nation as well as its second-largest oil producer. Those interested in getting a better perspective on the petroleum industry in Venezuela will find this book interesting and very informative reading.

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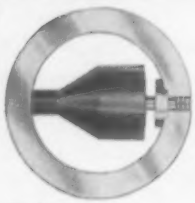

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Among the

Drilling Contractors

D. E. Vasser Drilling Co., Natchez, Miss., is drilling for Seaboard Oil Co. at a rank wildcat location in eastern Desha County, southeastern Arkansas. It is a Paleozoic test, scheduled to go to 5,000 ft. Location is 8 miles east of Kelso, in the NW SW NW 30-10s-1e. It is designated as 1 Anderson-Tully.

R. L. Gibson is contractor on a wildcat test Pan American Production Co. is putting down in the George W. Dyer Survey, 9 miles northwest of Omaha, in northern Morris County, northeastern Texas. Location is at 1 Pewitt.

Tools of **Miller & York,** Bakersfield Calif., are being used on a 7,300-ft. exploratory test Lane Petroleum Co. is undertaking in the Lanare area, in Fresno County, California. Location is for 26-29 Bernadon, in 19-17s-19e.

Pernie Bailey, Houston contractor, is drilling a 6,500-ft. wildcat test for Devon-Leduc Oils, Ltd., and H. A. Potter in southern Nueces County, lower Texas Gulf Coast. Location, at 1 Ellsworth, in Section 10, Ramon de Ynojosa grant, is 10 miles southwest of Corpus Christi.

R-B Well Service Co. is keeping a rig working for Union Oil Co. of California in new development on the southwest flank of the old Vinton field, in Calcasieu Parish, coastal Louisiana. Latest operation is at 2 Gray, projected to 5,400 ft.

Blanton Drilling Co., Houston, has a new wildcat operation under way 3 miles east of Tomball, northern Harris County, Texas. It is a contract job for Christie, Mitchell & Mitchell of Houston, at 1 Krezdorn in the J. S. Smith Survey. Objective is around 7,100 ft.

Nuckolls-Bell Drilling Co., Oklahoma City, is drilling on a 6,200-ft. contract it has with Johnson & Gill, also of Oklahoma City, at a wildcat location 5 miles southeast of Helsel, in Pottawatomie County, Oklahoma. The test is 1 Neal, in 6-6n-2e. Nearest production is 4 miles north of Cat Tail Springs field.

Circle Drilling Co., Lake Charles, La., is scheduled to drill another test for Vincent & Welch, also of Lake Charles, in the area 5 miles southeast of Hampton, in Evangeline Parish, South Louisiana. The new test (2 Fruge), the second in the area, is about ½ mile northeast of the first, abandoned at 8,600 ft. It is contracted to 8,700 ft.

Berg & Buck tools are drilling Powel Briscoe's newly started wildcat 5 miles southwest of Guthrie, in Logan County, Oklahoma. The test, 1 Poteet, in 11-15n-2w, is contracted to 6,100 ft. Nearest production is 1½ miles to the west in East Guthrie Lake field.

Nicklos Drilling Co., Houston, has another deep test scheduled for Continental Oil Co. in the Rayne area, of Acadia Parish, coastal Louisiana. Its rig, which has just completed Continental's third producer, a new pay discovery in the field, will drill a 13,000-ft. test a mile east of present production. The new operation is at 1 Blanchard, in 12-9s-2e. In addition to Nicklos, Falcon Seaboard Drilling Co. and Dillard & Waltermire Drilling Co. are working for Continental in the field, the former with two rigs and the latter with one.

Crow Drilling Co., Shreveport, is moving a heavy rotary rig to a wildcat location 2 miles southeast of Cheneyville, in Rapides Parish, Central Louisiana, where it will drill an 11,500-ft. test with itself and T. L. James, also of Shreveport, as joint operators. Location is for 1 Pope in 3-1s-2e, which is about a mile northeast of Cheneyville field.

Frio Drilling Co. will drill a 7,000-ft. test about a mile north of London Gin field, Nueces County, lower Texas Gulf Coast. It is a contract job for Carrl Oil Co. and Shore Exploration Co., joint operators. Location is for 1 Geistman, in Cuadrilla Irrigation Co. Survey.

Armstrong & Horn Drilling Co., San Antonio, is drilling on a 4,100-ft. test being put down under contract for Ed R. Bennett at 1 McCready in the J. W. Clifton Survey, 3 miles northeast of Fashing, in western Karnes County, South Texas. The location offsets a small pumper completed last November by the contractor in a 3,940-ft. sand.

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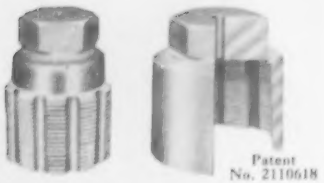

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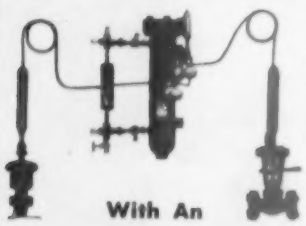

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The pumper, the only well drilled in the immediate area, has not been produced since completion.

C. J. Foster Drilling Co., Richmond, Tex., is starting another deep well for Warren Petroleum Corp. in the new development on the east flank of the old Anse La Butte dome, in St. Martin Parish, Louisiana Gulf Coast. The new operation is at 1 Shelton, in 73-9s-5e. It is scheduled to go to 10,000 ft.

Southern Six Drilling Co. has taken on a contract for a 13,500-ft. test to be drilled for F. A. Callery, Inc., at a wildcat location north of Stella field, south of New Orleans, in Plaquemines Parish, Coastal Louisiana. Location is at 4 Hero, in Unit 360, 16-14s-24e.

Delta Gulf Drilling Co., Tyler, Tex., is drilling a deep test at a rank wildcat location in northern Val Verde County, in the far southwestern part of Texas. It is a contract job for L. M. Glasco and J. C. McCrea. Location is 4 miles southeast of Juno, in Section 109, Block E, GC&SFRR Survey. The test, the only active operation in the county, is projected to 11,000 ft.

Phillips & Stephens Drilling Co. has a new wildcat operation under way 5½ miles south of Frankston, in Anderson County, East Texas. It is a 6,000-ft. test contracted for John B. Stephens, W. M. Coats and R. E. Moore. Location at 1 Dabbs, in the J. J. Pinson Survey, is 3 miles northwest of Boggy Creek field.

Zack Brooks Drilling Co., El Dorado, Ark., is drilling for F. Boykin King, of Homer, La., at a wildcat location 1¼ miles southwest of Antioch, in Claiborne Parish, North Louisiana. Contract calls for an 8,500-ft. test, which should carry the hole to its Cotton Valley objective. The test is carried as 1 Jarrell, with location in 35-22n-6w.

Barnes Core Drilling Co., Bakersfield, Calif., has taken a contract for a wildcat test Marvel Petroleum Co., Billings, Mont., is undertaking in the Mutau Flats area, northern Ventura County, California. The test, 1 Cuyama-Piru, in 28-7n-21w, is projected to 4,000 ft. It is the Montana company's first operation in California.

Woolf & Magee, Tyler, will drill a 6,000-ft. test for E. C. Wentworth, of Natchez, Miss., at a wildcat location 2 miles southwest of Ross Bayou field and about the same distance east of Willow Lake field, in Catahoula Parish, eastern Louisiana. Location is for 1 Rhone, in 7-6n-7e.

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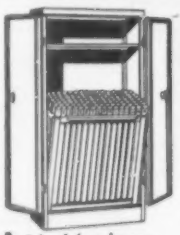

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REFINING

Contract Let

American awards initial jobs for new refinery

NEW YORK.—American Oil Co. has awarded a contract for engineering, dredging, and construction of pier facilities for its new 35,000-bbl. refinery to be built near Yorktown, Va., to Tidewater Construction Corp., of Norfolk.

American, the former Pan American Refining Corp., has requested bids from several contractors for design and construction of the refinery. General construction is expected to get under way early next year.

The new pier facilities will accommodate one 700-ft. super tanker, one T-2 tanker of about 550 ft., and two barges of 150 to 250 ft. Dredging will be carried to 40 ft. for the super tankers and to 20 ft. for the barges.

Wiley Jackson Co. has the contract for clearing the site and is approximately 70 per cent complete and on schedule.

Refinery Expansion Finished

REGINA.—Consumers Cooperative Refineries, Ltd., the oldest cooperative refinery in the world, has completed a multimillion-dollar expansion program at its 12,000-bbl. works here.

The company substantially increased its gasoline yield by adding a Universal Oil Products Co. fluid catalytic cracking unit, a U.O.P. polymerization unit, a vacuum unit, and a gas-recovery system.

The company's crude capacity was increased by converting a thermal cracker to a crude unit. All the units were designed and engineered by U.O.P., which also licensed the cat cracker and poly units.

The cracker has a design capacity of 4,500 bbl. of gas-oil fresh feed at 75 per cent conversion with a coke-burning capacity of 6,250 lb. per hour. The feed stock is derived from Leduc crude.

Wolf's Head Joins Trend

OIL CITY, Pa.—Wolf's Head Oil Refining Co. here has joined the multiviscosity trend with an SAE 10W-20W-30-grade oil which meets all requirements for MS and DG service. The new "Multi-Duty" oil is now being shipped from the refinery.

Power Plant to Use Resid

LINDEN, N. J.—Public Service Electric & Gas Co. of New Jersey is planning to erect a 450,000 kw. power plant at Linden, N. J., to be fueled by a high-viscosity fuel oil produced locally by Esso Standard Oil Co. Esso will in turn purchase steam and electric power from the new plant.

The new power plant will be fed by pipeline with the residual stock heated to between 450° and 600° F. A thermal-electric heating system will be employed to control fuel temperature.

NELSON REFINERY CONSTRUCTION INDEX

Appears on the Refining page in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained July 7, 1952 (page 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

INDEX (1946 = 100)

	1948	1950	1951	1952	1953	June 1954
Pumps, compressors, etc.	127.0	138.2	155.9	155.6	162.5	166.6
Electrical machinery	127.6	134.9	154.3	152.4	156.4	159.5
Internal-combustion engines	116.9	126.0	146.1	146.5	148.1	150.6
Instruments	120.0	127.8	142.3	146.2	151.8	153.9
Heat exchangers	130.0	140.0	152.0	165.8	174.9	175.9
Miscellaneous equipment average	*122.1	*126.2	*145.1	153.3	158.8	161.3
Materials component	139.3	149.5	164.0	164.3	172.4	173.6
Labor component	128.0	144.0	152.5	163.1	174.2	183.0
Refinery construction index	132.5	146.2	157.2	163.6	173.5	179.2

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the Miscellaneous Equipment Items shown above.

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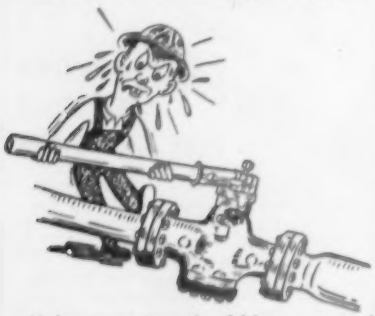

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Parsons Bids Low

Indiana Standard awards contract for Ultraformer

CHICAGO.—Standard Oil Co. (Ind.) has awarded The Ralph M. Parsons Co. of New York, a construction contract for the 14,000-bbl. per day Ultraformer to be built at the Sugar Creek, Mo., refinery.

The unit will be located on high ground just south of the refinery's fluid catalytic cracking unit. It will employ the low pressure, regenerative process developed by Indiana Standard and will charge a wide range of feed stocks according to H. R. Boehmer, manager at Sugar Creek.

The new unit will give the 73,000-bbl. per day refinery a catalyst reforming capacity equal to over 19 per cent of crude capacity, and will raise the relative capacity for all Indiana Standard and affiliated refineries to 16.3 per cent of crude capacity.

The first Ultraformer to go on stream was at the El Dorado, Ark., refinery of the subsidiary Pan-Am Southern Corp. Units are under construction at Pan American Refining Co.'s Texas City, Tex. refinery, and Indiana Standard plants in Casper, Wyo., and Wood River, Ill. Great Northern Oil Co. is planning a unit at the new St. Paul, Minn., refinery and Canadian Petrofina, Ltd., is incorporating one into the new refinery building at Point-aux-Trembles, near Montreal.

Petrochem Unit Increased

LOS ANGELES.—Union Oil Co. has started work at its Wilmington, Calif., refinery on the ammonium sulfate plant to boost the unit's capacity to 70 tons daily.

The increased capacity will enable Union to use acid sludges available at the refinery. Additional ammonia will be purchased from Union's subsidiary, Brea Chemicals, Inc., which in June completed its $13,000,000 plant east of here.

Unifiner Due on Stream

CUT BANK, Mont.—A new Unifining unit is due shortly to go on stream at the refinery here of Union Oil Co. of California. The 600-bbl. per day hydrogenation unit will derive hydrogen from a 600-bbl. per day Catformer recently completed at the refinery.

The Catformer is a catalytic reforming unit licensed by The Atlantic Refining Co. Unifining is licensed by Union Oil and Universal Oil Products Co.

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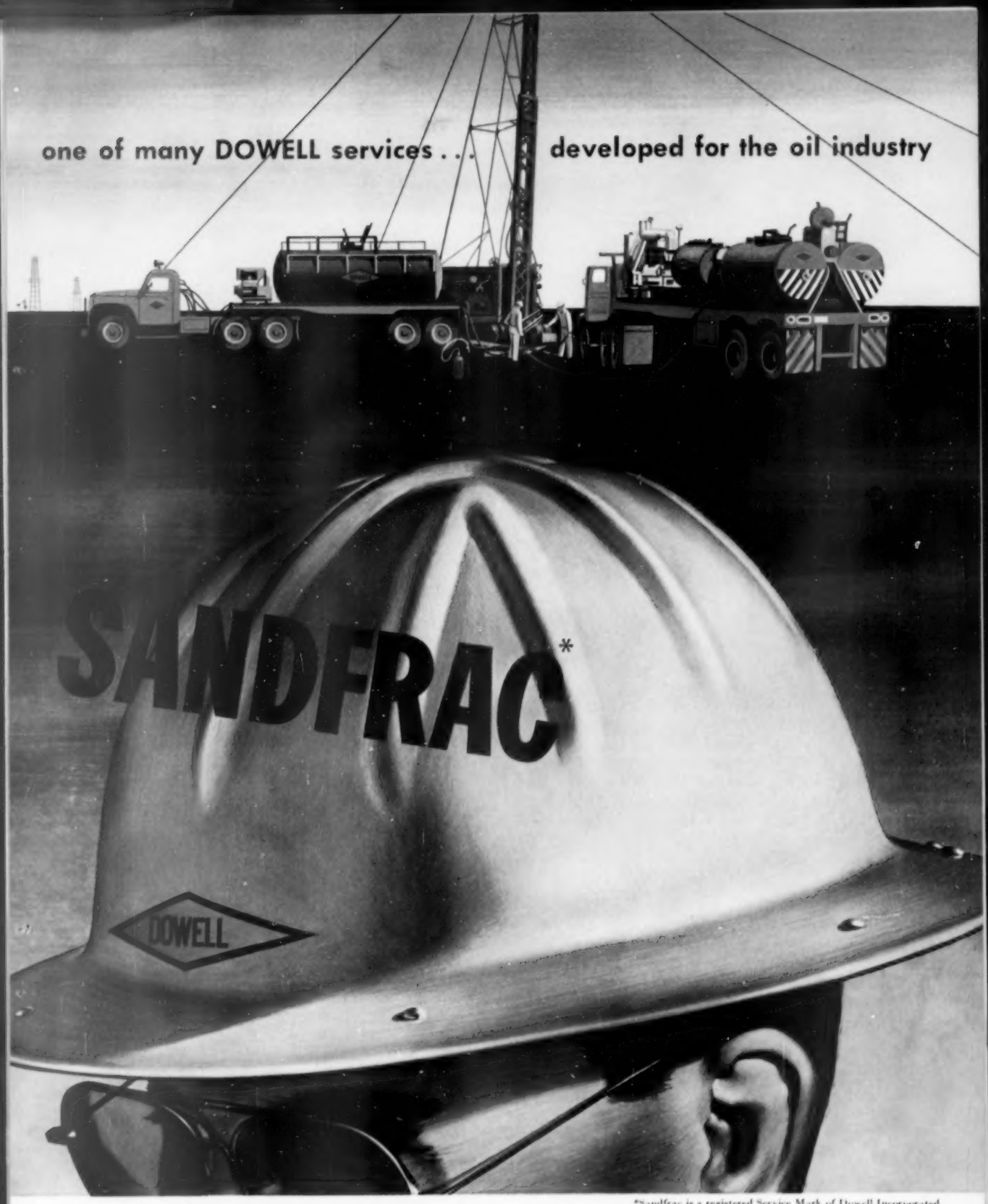

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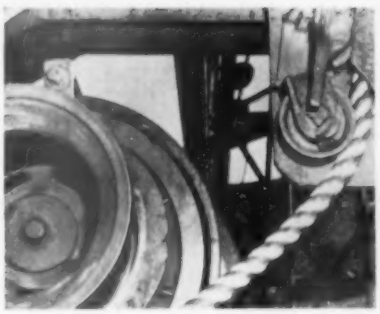
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller



Cat-Line Grip Provides Better Line Control

A new roller-type catline grip combines all the safety features of standard models, but also provides a special sheave for added catline control. This special sheave acts as a guide to give additional control in threading through the catline grip.

The grip embodies an all-steel safety device which securely holds the catline at any desired point and eliminates the possibility of accidents and burned catlines caused by slipping of the cathead. The line can be inserted or removed instantly through a side opening without threading through the grip. A positive safety latch prevents accidental removal of the line. The eccentric cam wedge is shaped to the contour of 1½-in. rope and designed with dull teeth which takes a positive grip without damaging the catline. These units are designed to take 6,000-lb. working load with a four-to-one safety factor. They are available in right-hand or left-hand grips. *Byron Jackson Co.*

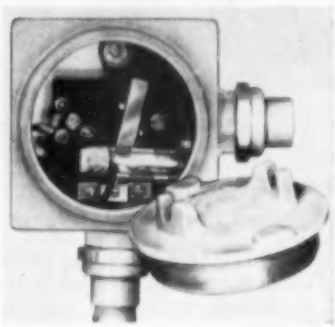
Check No. 1 On The Time-Saver Card

●

Cooling Tower Safeguard Prevents Vibration Damage

Dual-Safety switch, a combined vibration cutoff and safety switch for cooling tower fans, offers effective protection against both extensive vibration damage and personnel accidents. It prevents costly tower repairs resulting from blade breakage and equilibrium loss on fans. A sensitive mercury switch automatically stops a fan's electric current when vibration indicates trouble. Sensitivity is easily set by a manual adjustment.

In no way can the faulty fan be started again, except by resetting the Dual-Safety switch after maintenance is completed. In addition, the Dual-Safety switch is said to assure maximum safety for personnel working in the fan stacks. This special safety feature eliminates any accidental resetting by vibration or any person. The switch is operated from the cooling-tower deck without entering the fan stack. Its fixed



position on the gear-supporting beam is aligned for instant reaction to any fan or driving-shaft irregularity.

The Dual-Safety switch is attached to each fan on a Santa Fe cooling tower. This new combination control can be utilized in any existing cooling tower. *Santa Fe Tank & Tower Co., Inc.*

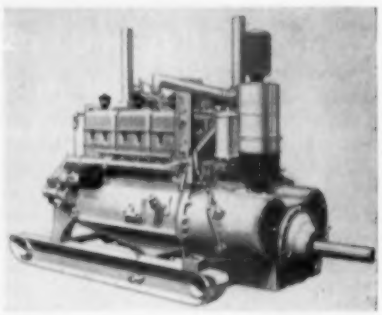
Check No. 2 On The Time-Saver Card

●

New Industrial Engine Provides High Horsepower

High horsepower in the range from 252 to 290 is provided in the new, heavy-duty 1,600-12A industrial-power unit. The unit operates with 12 volts on either natural or L.P.G.

Dual six-cylinder engines of the MM 800-6A class, mounted in parallel, are geared to a single power-takeoff shaft. Displacement is 1,600 cu. in. Bore and stroke are 5 5/16 by 6 in. Horsepower



ratings are: 290 at 1,300 r.p.m. and 273 at 1,200 r.p.m. on L.P.G.; 262 at 1,300 r.p.m. and 252 at 1,200 r.p.m. on natural gas.

With high compression for low-cost power on big jobs, the new unit is designed for use on large-volume-pumping applications, generator sets, and oilfield equipment.

The MM 1600-12A heavy-duty construction and high torque at moderate r.p.m. afford reserve capacity for continuous operation. Aluminum pistons and counterbalanced crankshaft improve intermittent high-speed performance, and give smooth, fast acceleration. *Minneapolis-Moline Co.*

Check No. 3 On The Time-Saver Card

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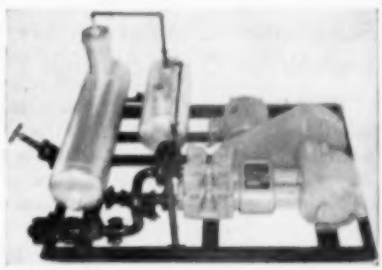

Crude-Oil Gathering Made Automatic With New Pump

A new high-pressure, low-volume reciprocating pump, the new Figure 333, will deliver from 15 bbl. per hour at 1,000 psi. (with 1¾-in. liners) to 50 bbl. per hour at 340 psi. (with 3-in. liners) when operating at 1,000 r.p.m. and requires 7½ hp. A complete selec-

tion of liners is available to give many intermediate volume-pressure ratios within this range. The fluid end is available in bronze for use in salt-water disposal, and cast iron for crude-oil service.

A special, automatic, gathering-line adaption for this pump has been developed, in cooperation with a major producer. With this setup, as many as three field batteries may be fed into a pipeline automatically.

The producer's tank line is brought into a volume-header tank which contains a float switch. When gravity-fed oil from the tank fills the volume-header tank, the float switch starts the pump. When the tanks are pumped out, the switch shuts down the pump. Thus the pumper's duties are materially reduced.

To avoid air locking the pump, an air-bleeder line is brought out of the volume-header tank and led to a sump tank. The air is relieved through a valve and any oil which may have been carried over is led back into the volume-header tank through a line protected by a check valve. *Frank Wheatley Supply Co.*

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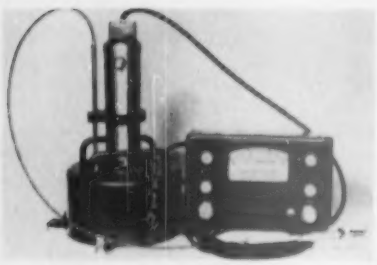

Scintillation Counter Logs Weak Gamma Levels

The Ferret is an ultra-sensitive scintillation survey meter for oil prospecting. It consists of a scintillation detector head and a count-rate meter. The detector head uses an oversize gamma-sensitive crystal, 2-in. diameter by 2-in. thickness, optically connected to a photomultiplier tube. The count-rate meter has six ranges of sensitivity and four variable time constants.

The Ferrest can be used for any type of geophysical survey calling for the detection and logging of extremely weak gamma radioactivity levels. This scintillation survey meter can be used for fast, as well as slow, reconnaissance from a low-flying aircraft or moving vehicle.

For increased sensitivity and directionality, thick lead shielding surrounds the crystal. Discriminate use of the lead shielding around the crystal, but not around the photomultiplier tube, gives the Ferret a high sensitivity-to-weight ratio. The equipment weighs 53 lb. and is battery operated, using standard low-voltage batteries. *The Radiac Co., Inc.*

Check No. 5 On The Time-Saver Card

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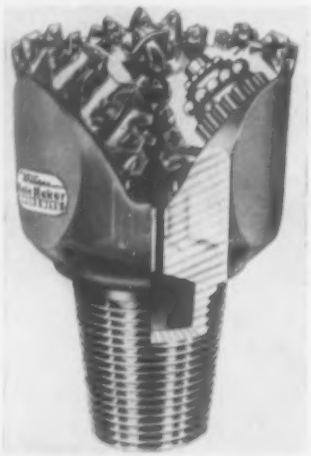

Three-Cone Rock Bit Is Designed For Air Or Water

A new three-cone rock bit, designed for either air or water drilling, is made of the highest nickel-moly steel. It is particularly effective in shale or hard-rock formations. It is available with either full or jet-hole-water courses. All friction surfaces are undercut and Stellite metal has been added. All bearing surfaces are ground finished and the finest alloy steels are skillfully heat treated. The bit may be bought in sizes: 3¾, 3⅞, 4¼, 4½, 4¾, 4⅞, 5⅝, 6¼, 6¾, and 7⅞ in. *Oil Tool Manufacturing Co.*

Check No. 6 On The Time-Saver Card

●

Self-Sealing Valve Has Been Tested in Texas

A new type of large-diameter conduit valve, manufactured in sizes 8 in. and larger, offers a dependable answer to the problems of pipeline service. Highly successful tests in Texas fields have been completed.

Positive seal is accomplished by means of a special sealant developed for this service. Two reservoirs within the valve contain enough sealant for about 50 operations of the valve. When the valve is closed, line pressure forces the sealant into a channel on the downstream face of the seat. The only servicing required on these valves is periodic recharging of the cylinders with sealant which, with pressure guns, takes only a few minutes. *Darling Valve & Manufacturing Co.*

Check No. 7 On The Time-Saver Card

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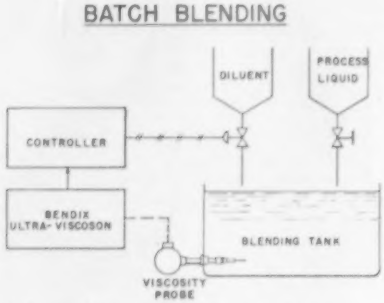

Ultra-Viscoson Controls Process Through Viscosity

The Ultra-Viscoson, a new viscosity-measuring instrument, utilizing ultrasonic principles, is now offered in a complete line of indicating, recording, and control systems which feature a new approach to process control through viscosity.

The versatility of these systems can be emphasized by the fact that they are presently being employed very successfully to control fuel-oil blending, fractionation of lubricating oils, asphalt oxidation, and asphalt cutback in petroleum refineries. Marked success has also been achieved with interface detection. *Bendix Aviation Corp.*

Check No. 8 On The Time-Saver Card

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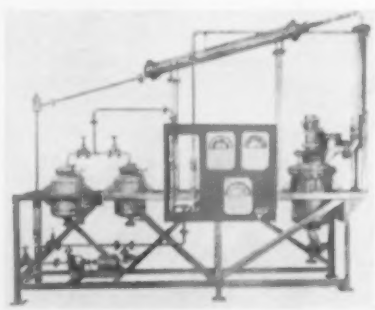

Semipilot Plant Unit Aids in Process Studies

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AC-ME RECORDING GRAVITOMETER • AC-ME SPECIFIC GRAVITY BALANCE

for accurate gas measurement.

- **SENSITIVE**
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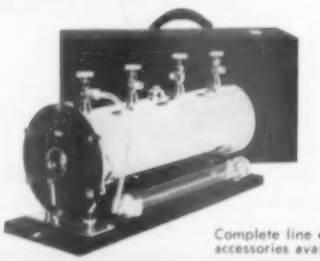
- **AUTOMATICALLY COMPENSATED**

This instrument has been designed for accuracy in determining specific gravity of gas—it contains no rotating parts that will wear out and operates on the principle of weighing a volume of gas in comparison with an equal volume of air.

ADOPTED BY THE NATURAL GASOLINE ASSOCIATION AS THE MEANS FOR DETERMINING THE SPECIFIC GRAVITY OF NATURAL GAS

Designed and constructed to meet the specifications required for determining the specific gravity of gas under the various conditions found in both field and laboratory.



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basic design data, determining the effects of variables, and evaluating the practical economics of the process. The entire unit is shipped preassembled or in match-marked parts, for simple installation. It requires less than 55 sq. ft. of floor space, and is only 12 ft. in height. In addition, it is easy to operate and maintain, has a wide range of flexibility, and offers exacting control.

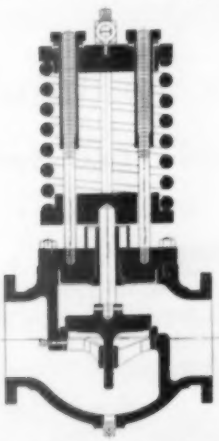
The assembly includes these basic components: 25-gal., jacketed reaction vessel, equipped with an agitator with interchangeable impellers, a variable-speed drive, and a flush-bottom valve; jacketed column that can be packed or left empty; shell-and-tube condenser; condensate pump; control panel, where reflux and product takeoff rates are controlled and measured, and temperature and pressure controllers and recorders may be installed, and two 15-gal. receivers. *Industrial Process Engineers.*

Check No. 9 On The Time-Saver Card

●

Single-Spring Design is Featured in Relief Valve

Single-spring construction, more accurate valve seating, and lower over-all height feature new versions of these spring-loaded relief valves. Single-spring construction in these models eliminates the cumbersome, unstable superstructure of conventional multiple-spring relief valves. Design keeps over-all spring length at a minimum. This factor, combined with large-coil diameter and heavy cross wire section, results in an ideal 1/r ratio which provides maximum spring stability. In addition, the spring is constructed so there is the least possible difference between the pressure required to unseat the valve and that required to force it full open.



Guiding spindles at both top and bottom of the valve disk assure accurate seating, permit the use of the valve in any position, and allow installation in either vertical or horizontal pipelines.

Use of bushings threaded at the lower ends, eliminates long spring rods extending above the valve and permits the use of rods which do not extend beyond the upper spring plate after compression. In this manner, over-all valve height is considerably reduced. *Schutte & Koerting Co.*

Check No. 10 On The Time-Saver Card

●

Cementing Shoes, Collars Have Aluminum Internals

Designated as the Type A, these new all-metal cementing shoes and collars use a special aluminum alloy to replace the usual cement or bakelite internals in the conventional float shoes and float collars. The aluminum alloy has much greater impact, compression, tensile, and shear strength than either cement or bakelite.

It can be machined and ground to close tolerances, which not only insures more accurate fit in the shoe or collar body, but assures a smoother seating surface for the ball-and-seat valve arrangement in the shoe and collar.

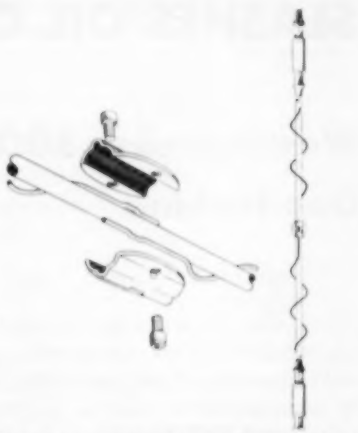
The aluminum alloy is not only easily drillable but, due to its superior strength, much less of it is required in making up the assembly so that considerably less time is required to drill it out. *Rector Well Equipment Co.*

Check No. 11 On The Time-Saver Card

●

Remover-Homogenizer Keeps Paraffin In Suspension

The Besse paraffin remover-homogenizer is a highly efficient new tool to keep paraffin in suspension in pumping oil wells. By forcefully agitating well fluids during both upstrokes and downstrokes, and by allowing standing well fluids to wash the tool during the downstroke, the paraffin remover-homogenizer prevents the accumulation of paraffin solids on tubing walls and rod string.



Actual results show the new tool to be remarkably effective even in fields of highest paraffin incidence. The equipment is made of three essential parts: a clamp which attaches to the sucker rod and two steel spirals. These spirals lead outward from the clamp, encircling the sucker rod, but in contact with the rod only at the clamp. The outside diameter of the spiral is ¼ in. smaller than the inside diameter of the tubing and affords no appreciable restriction going in or coming out of the hole, or while the well is producing. *Woolley Tool Service.*

Check No. 12 On The Time-Saver Card

●

Flexible, Semi-Rigid Pipe Announced by Tube-Kote

Both flexible and semi-rigid plastic pipe are now manufactured by Tube-Kote, Inc. TK-202 is a flexible plastic pipe made of polyethylene, and TK-404 is a semi-rigid pipe made of cellulose acetate butyrate.

Both TK-202 and TK-404 are corrosion resistant, rust proof, and rot proof. TK-202 is adaptable for use as surface water lines, water wells, jet wells, and for use in oil fields, and other industries. TK-404 is produced especially for oil-field use and is not affected by sour or paraffin-laden crudes, salt water, various acids, alkalies, salts, hydrocarbons, and other fluids. These two types of plastic pipe compare favorably with steel pipe for many uses. *Tube-Kote, Inc.*

Check No. 13 On The Time-Saver Card

PICK BOOSTER POWER THAT NEEDS NO WATER, SLASHES OIL CONSUMPTION!

...Westinghouse 5000-hp Gas Turbine

Think what these two features alone mean to your operations! Lube oil consumption for both turbine and compressor is just a small fraction of that used by most boosters! And no cooling water is required, making it possible to put booster stations almost anywhere on the line, and greatly simplifying installation.

There are other features, too, which make Westinghouse Gas Turbines the lowest cost booster power available:

- ★ Up to 25% extra power — during winter months when demand is the greatest.
- ★ Lighter foundation — much less than for most boosters.
- ★ Simple to operate—need only one man per shift.
- ★ Inexpensive to maintain—turbine has extremely few moving parts, as much as 85% fewer than other boosters.
- ★ Single responsibility — Westinghouse integrates and sells a complete turbine-compressor booster, ready to install.

The savings these features offer you can make Westinghouse Gas Turbines a sound, low-cost choice for your next booster station. Your Westinghouse Salesman has complete data . . . call him or write: Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

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WESTINGHOUSE 5000 HP GAS TURBINE

Don Jenkins, Gas Turbine Sales Manager, points out two special gas turbine features which add up to big savings on gas pipeline booster operation.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Hydro-Line Pumps describes and illustrates two types of vertical, encased, close-coupled pumps for the handling of hydrocarbons, hot or cold water, mild acids, and salt solutions. In addition to explaining the importance of the wide-application flexibility, space-saving qualities, and excellent net-positive suction-head characteristics of the pumps, Bulletin B-1700 completely documents and illustrates the many construction features of both a process-type vertical-can pump and a transfer-type vertical-can pump and points out where each may be advantageously and profitably applied. *Peerless Pump Division, Food Machinery & Chemical Corp.*

Check No. 14 On The Time-Saver Card

●

LimiTorque Valve Controls, a complete new 21-page Catalog L-54, fully describes LimiTorque valve operators. LimiTorque eliminates the need for manual operation of valves, and features simplicity, economy, and dependability when fully automatic operation is desired. As the name implies, LimiTorque limits the amount of torque applied to valve-operating parts. *Philadelphia Gear Works.*

Check No. 15 On The Time-Saver Card

●

Industrial Periscopes. This four-page Bulletin No. 301 covers construction of typical periscopes, steps necessary in planning for an industrial periscope, and data needed when ordering an industrial periscope. *Kollmorgen Optical Corp.*

Check No. 16 On The Time-Saver Card

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Oil-Field Rubber Products Catalog, a new 52-page, 2-color catalog illustrates and describes the complete line of PB oil-field rubber products. More than 30 different product categories and several hundred models are listed, including drill-pipe protectors and stabilizers, pipe wipers, wire-line guides, bumpers, mud equipment, and other oil-field specialties. One of the features of this new catalog is the Clearance Ratio Charts for instant, accurate selection of the correct size of protector or stabilizer for any drilling operation. Detailed descriptions of all products are provided, including individual weights, sizes, prices, and code names. *PB Division, Byron Jackson Co.*

Check No. 17 On The Time-Saver Card

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Disaster, a new Booklet No. 5000-4, designed to assist industrial plants in choosing safety and rescue equipment for use in emergencies, assumes the existence of groups or teams within a plant whose job it is to effect rescue and recovery operations in case of tornadoes, fires, explosions, or other types of emergencies. It is published to show just what items of equipment are needed by these teams. Separated into five sections, the booklet discusses the equipment needs of a rescue team, an engineering team, and a medical team, and contains a table-of-equipment check chart for quick reference. It also has a catalog description and picture of each item recommended. *Mine Safety Appliances Co.*

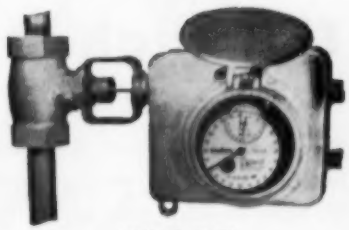
Check No. 18 On The Time-Saver Card

●

Chempac Packings & Gaskets is the title of a new six-page, illustrated fold-

The time you save today is the money you make tomorrow.

Enardo has designed two time cycle switches for your convenience; the model "A" and the model "MB" both are dependable hand wound clock movements, set in cases that are vapor proof, dust proof, and moisture tight; the difference being that the model "A" is a mercoid tube switch and the model "MB" employs an underwriter's laboratory approved micro-switch. They are both designed to shut down your engine at a pre-determined time. Both come in 12 and 24 hour time cycles and have "run-times" of 11 hours on the 12 hour model and 22 hours on the 24 hour model.



MODEL "W"

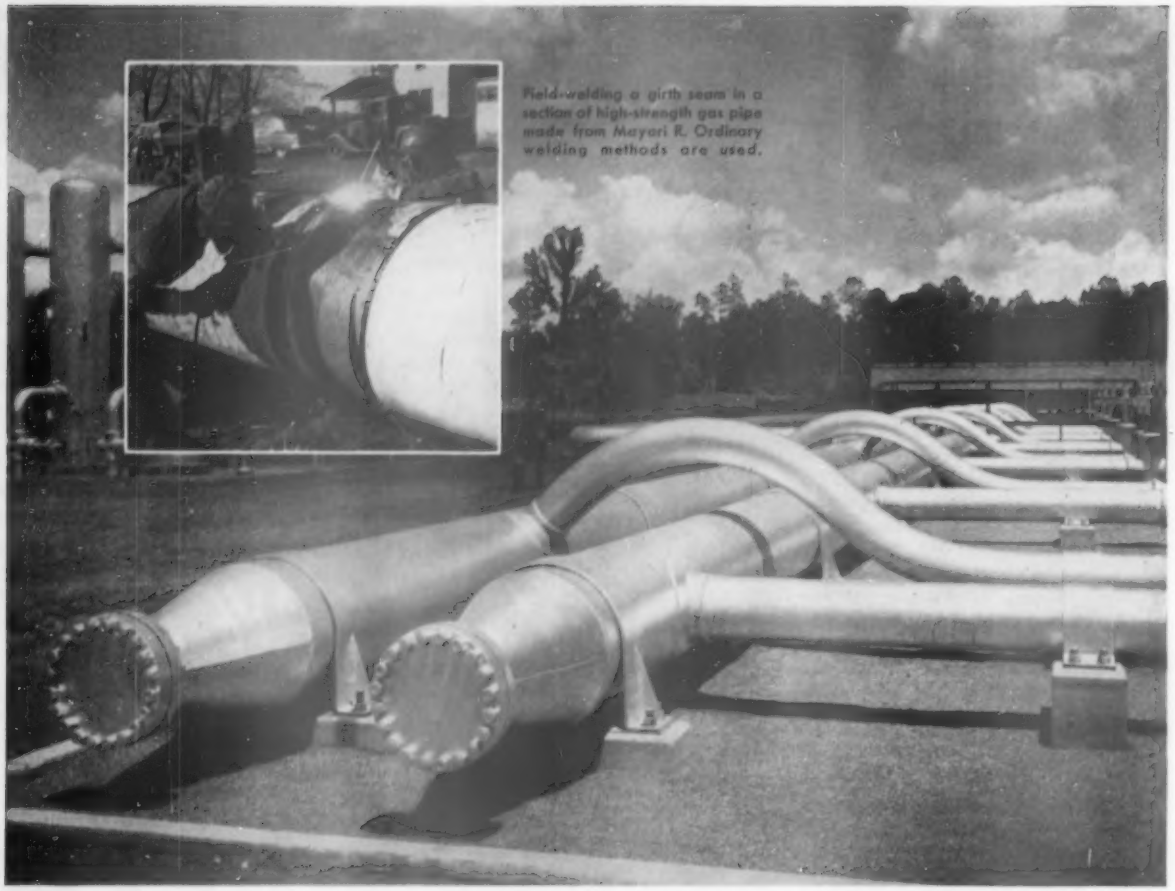
Enardo has developed another time and money saver called the model "W" clock shut-off valve. It is designed to control the flow of pressures up to 100 PSI of gas or liquid, and to shut off the supply at a pre-determined time. It is particularly adaptable for use on fuel lines to engines. The model "W" clock is manually set and has the same "run-time" as the above models.

MODEL "A"

You will find that these clocks will eliminate a large percentage of return trips. Write Enardo for bulletins 10-01, 10-03, 10-05.

ENARDO manufacturing company

BOX 1647 • TULSA, OKLAHOMA



The 30-inch pipe, header tees and swages shown above were all fabricated from Mayari R, Bethlehem's high-strength, low-alloy steel.

This high-strength pipe is easy to weld

Pipe made from Mayari R—Bethlehem's high-strength, low-alloy steel—has welding properties equal or superior to those of other pipe having the same load-carrying capacity. Simply follow your usual field-welding practices, using ordinary mild-steel rods. The weld metal will pick up enough alloy content to match the Mayari R's high mechanical properties. Under normal conditions, there's no need to preheat unless the pipe walls exceed ¾ in.

Resists Fatigue—Mayari R steel combines high-strength with extreme ductility. Its physical properties include a yield point of 50,000 psi min; ultimate tensile strength of 70,000 psi min; and an unusually high endurance limit of 60 to 70 pct of the tensile strength. As a result, pipe fabricated from Mayari R has the ductility, resistance to fatigue and the impact qualities needed to handle vibration and other severe stresses encountered at compressor stations.

Savings of Materials and Money—Due to its superior mechanical properties, high-strength gas pipe made from Mayari R may be used in lighter wall thicknesses than ordinary carbon-steel pipe.

Ask the nearest Bethlehem sales office for complete information about Bethlehem Oil and Gas Pipe, whether made of high-strength Mayari R, or ordinary carbon steel meeting ASTM A134 and API 5LX42.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM OIL AND GAS PIPE

er. These various Chempac materials, which are virtually unaffected by corrosive chemicals and active solvents, are made of asbestos treated with Teflon. They are especially designed for chemical and process equipment. The folder gives pertinent information on each of the several types. These include Chempac interlocked packings, a braided material offered in two styles; Chempac packings in coil, spiral, and ring forms which are offered in four styles; general-purpose Chempac gaskets offered in two styles; Chempac folded gaskets for glass-lined equipment offered in two styles; and Chempac Spirotallic flange gaskets (made of Teflon treated asbestos and stainless alloys) for high-pressure service. *Johns-Manville.*

Check No. 19 On The Time-Saver Card

●

Controlled-Volume Pumps in Process Instrumentation Bulletin 1253 describes and illustrates how controlled-volume pumps can be used as flow controllers, ratio controllers, and final-control elements in process instrumentation. The first section of this 24-page pump handbook describes the various types of controlled-volume pumps available, and how they operate. The second section contains approximately 20 different process flow diagrams describing applications in chemical, petroleum, water treating, and other industries. An engineering data section contains valuable information on fluid characteristics and piping. *Milton Roy Co.*

Check No. 20 On The Time-Saver Card

●

Tools of Automation, a new 12-page booklet expresses the company's philosophy of combining applied engineering, creative thinking, and electric-motor drives to provide the know-how for automation of single machines or continuous processes. Many illustrations and sketches accompany each section *Reliance Electric & Engineering Co.*

Check No. 21 On The Time-Saver Card

●

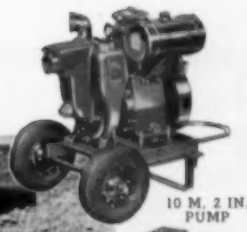
Vogt Multistream Steam Generators Bulletin MSG-1 covers equipment and a method for concentrating refinery waste-heat sources to produce low-cost steam. Illustrations show various elements of the steam generator before assembly. Each unit is designed to utilize several hot-oil streams which, taken alone, are not sufficient to be used for the production of steam. *Henry Vogt Machine Co.*

Check No. 22 On The Time-Saver Card

you can RELY ON-

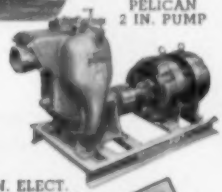
GORMAN-RUPP

SELF-PRIMING CENTRIFUGAL PUMPS



10 M. 2 IN. PUMP

PELICAN 2 IN. PUMP



4 IN. ELECT. MOTOR DRIVEN PUMP

FOR MORE TROUBLE-FREE USE WITH LESS FUEL AND LESS MAINTENANCE

These pumps are built for hard use. Three months continuous runs without shutdowns are not uncommon.

Gorman-Rupp Pumps are the Quickest Priming, Highest Priming, Fastest Pumping and Most Reliable pumps available.

A COMPLETE LINE OF CENTRIFUGAL PUMPS IS AVAILABLE FROM ¾", 1000 G.P.H. UP TO 10", 240,000 G.P.M. CAPACITY.

Mid-Continent and Gulf Coast Oilfield Representative

HENRY H. PARIS DISTRIBUTOR, INC.

1125 ROTHWELL STREET, HOUSTON, TEXAS

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

INSTALL

peak performance

INTO YOUR

compressors

(AIR • GAS • AMMONIA)

Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

Check THESE **VOSS VALVE ADVANTAGES:**

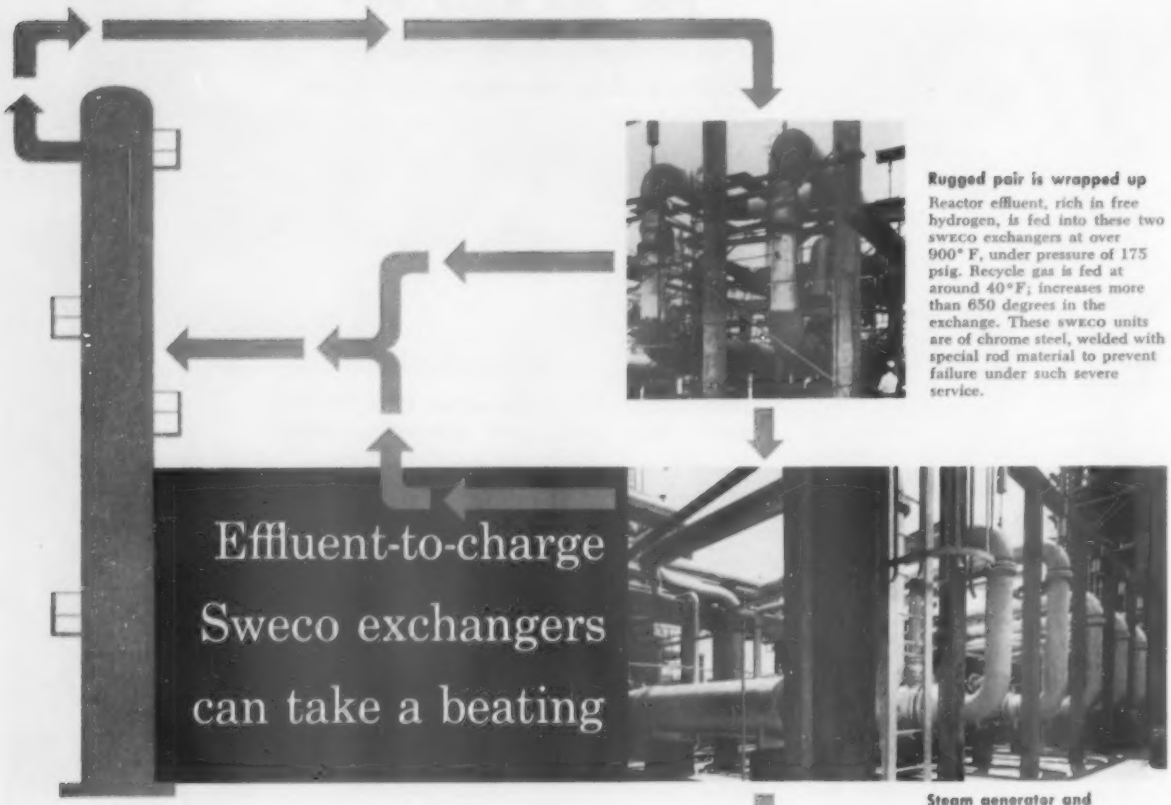
- Quiet, vibration-free operation
- 20 to 60% more valve area
- less power consumption
- minimum pressure loss
- normal discharge temperature
- lower operating costs
- utmost safety

Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

J. H. H. **VOSS VALVES**

REG. U.S. PAT. OFF.

VOSS VALVES / J. H. H. VOSS Co., Inc. 785 East 144th Street, New York 54, N. Y.



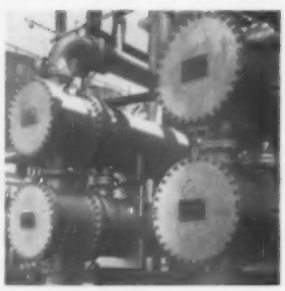
Effluent-to-charge Sweco exchangers can take a beating

Rugged pair is wrapped up

Reactor effluent, rich in free hydrogen, is fed into these two SWECO exchangers at over 900° F, under pressure of 175 psig. Recycle gas is fed at around 40°F; increases more than 650 degrees in the exchange. These SWECO units are of chrome steel, welded with special rod material to prevent failure under such severe service.

Steam generator and Naphtha feed

Steam is generated in two of these SWECO exchangers; in the other four, the naphtha charge to the reactor picks up more than 400 degrees of heat from the effluent.



Sweco condensers finish the job

Final stage in the heat-transfer is accomplished in this bank of four SWECO condensing units. (The effluent loses a total of nearly 800 degrees in passing through the SWECO exchangers in these illustrations.)

It's a tough assignment for a heat exchanger to transfer nearly 225,000,000 BTU over a temperature range of 800°. A SWECO exchanger train, consisting of 12 shells, is doing it in the new Thermofor Catalytic Reformer (TCR) at General Petroleum Corporation's Torrance refinery.

To withstand the wide variation in temperatures in the first stage of heat transfer, SWECO engineered and fabricated exchangers of special high-temperature chrome steel . . . *using welding rod producing metal of identical analysis to the parent metal.* This required precise pre-heat and post-heat treatment of the entire unit during the welding operation.

Fine shop equipment—years of experience in fabricating steel and special alloys—personal follow-through to meet customers' exact requirements and time schedules—all combine to make SWECO a dependable source for engineering and manufacturing process equipment, *no matter how tough the assignment.*

Send for bulletin showing standard SWECO exchangers . . . and giving details of our engineering and manufacturing services.

GET A SWECO PROPOSAL ON YOUR NEXT JOB

SWECO

Southwestern Engineering Corporation

Engineers and Constructors . . . Manufacturers
Serving the process industries

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SWECO PRODUCTS

Heat Exchangers
Custom fabrication of all types of steel and special alloy vessels for the process industries.

Screen Separators.

EQUIPMENT MEN . . . in the News

Lane-Wells Opens New Branch at Pratt, Kans.

To serve the increasing needs of the southern Kansas field, because of the steadily increasing activity in that area, Lane-Wells Co. has opened a new branch in Pratt. This location was selected as the strategic center for quickest service to all parts of this area.

W. J. Gray, formerly at Russell, Kans., is in charge of the new location. Gray is a veteran in oil-field service, having been with Lane-Wells since 1948. R. M. Johnson and Don E. Ruegsegger, both experienced Lane-Wells personnel in the Kansas district, joined Gray to staff the new branch.

Welex Announces Promotion Of Three to Key Positions

B. CRICE

L. M. (Merle) Robertson has been named district manager of Gainesville district, Charles D. McDonald has been appointed division sales engineer for Gulf Coast division, and Billy Crice has been promoted to the position of sales engineer with the Beaumont district office as announced recently by Welex Jet Services, Inc.

L. M. ROBERTSON

C. D. McDONALD

Robertson came to Welex with an intensive background of oil-well-service work, having spent 6 years with service companies in North Texas.

McDonald, who recently joined Welex, has a career of 14 years of oil-well service behind him, having worked as a division manager and superintendent for equipment and tool companies.

Crice, who has been with Welex as a rigman and shooter in the company's Victoria and Corpus Christi, Tex., offices, has several years experience in the oil industry.

H. C. Smith Executives Attend Ventura Plant Opening

Executives and sales engineers of H. C. Smith Oil Tool Co. attending the opening of the company's new office and warehouse in Ventura, Calif., are: standing, Ray Faulk, Fillmore branch manager; Herschel C. Smith, vice president and general manager; Virgil Fowler, San Joaquin division manager; Gene Madsen, southern division manager; Frank Zuech, Cuyama branch manager; Ralph Dunn, service-department manager. Seated are: Tom Eakin, Ventura sales; A. B. Williams, Coast division manager; Art Marshall, general sales manager; H. C. Smith, president; O. C. Schmidt, chief design engineer. Kneeling are: Frank Bush, office; Art Hawkins, Ventura branch manager; Charles Petrie, Ventura sales; and Jack Lander, Fillmore sales.

Schlumberger Makes Shifts In Tex.-Okla. Personnel

Schlumberger Well Surveying Corp., has announced several personnel transfers in the Texas and Oklahoma area.

Don Mitchell, who was formerly location manager at Roswell, N. M., has been transferred to Dallas as assistant to the division manager.

H. J. Nickel has been transferred to Perry, Okla., as location manager. He was formerly field engineer at Flora.

R. W. Bashe has been transferred from location manager at Perry to Ardmore, Okla., where he will take over location-manager duties.

Chicago Bridge Announces Sales Department Changes

Chicago Bridge & Iron Co. has announced the following changes in personnel. Fred L. Goldsby, general sales manager, was elected vice president of the company recently. Effective September 1, 1954, Raymond A. Johrde was transferred to the company's Los Angeles sales office from Tulsa office and H. B. Funderburk to the Houston sales office from Birmingham, Ala., plant.

George E. Borst, who has been manager of the company's Philadelphia sales office, was appointed manager of the New York sales office, and Lucian J. Harris, formerly of the Los Angeles sales office, was appointed manager of Philadelphia sales office.

Dowell Promotes Gore To Petroleum Engineer

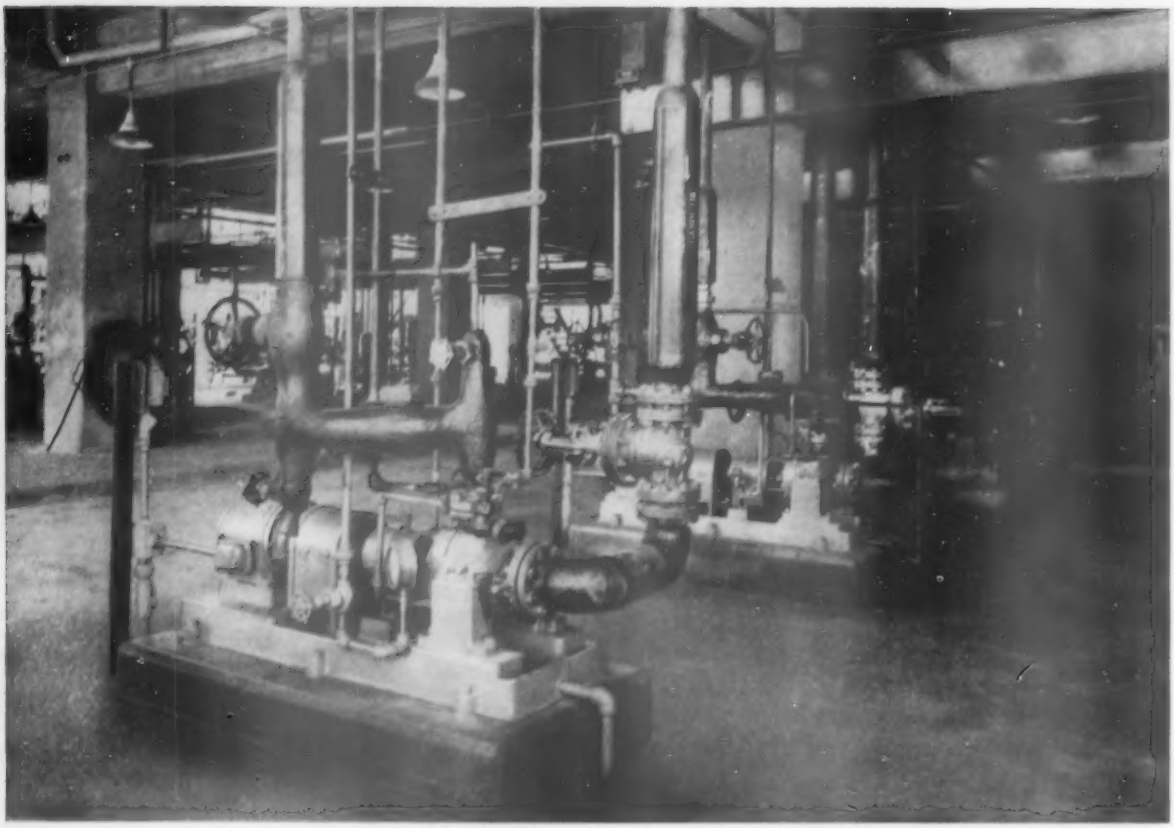
G. L. GORE

Dowell Incorporated, oil-well-servicing company, Tulsa, has promoted George L. Gore to petroleum engineer and transferred him to the company's Rocky Mountain operations area with district offices at Denver, A. C. Polk, vice president and general manager, has announced.

Gore's new duties will include supervising the technical phases of operations in Colorado, North Dakota, South Dakota, Montana, Wyoming, Utah, and parts of New Mexico and Nebraska.

Gore joined Dowell in Great Bend, Kans., in 1949 as a junior service engineer. At Great Bend he received subsequent promotions to service engineer and development engineer.

He was transferred to Dowell's general office in Tulsa as a development



3 OF THE 11 HM PUMPS which set maintenance record at Taylor Oil's cat-cracking plant

11 HM pumps run 2 years for Taylor Oil with only 15 hours' special maintenance!

How long?

Two years with just fifteen man-hours for maintenance other than routine checks. This news came as no surprise, however, to the Worthington engineers who designed and built the Type HM pump *specifically* for tough, heavy-duty work. But it's down in black and white in the maintenance records of the Taylor Oil and Gas Company's cat-cracker in Corpus Christi, Texas.

Here are two reasons why these pumps kept going:

1. Centerline support, water-cooled stuffing box and bearing for efficient high temperature duty.
2. Confined casing gaskets and hook-type hardened stainless steel shaft sleeves.

And piping is simplified because the HM is an end-suction design, which also eliminates interference of valving in suction and discharge lines.

Keep the HM in mind for heavy-duty applications. You can have it in carbon steel, alloy steels or cast iron. Get in touch with your nearest Worthington district office or write for free Bulletin W-341-B14 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey. C-4.3

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

TYPES HR AND HB. 19 sizes. Capacities up to 1,800 gpm. Developed heads up to 900 ft. Proper selection of material permits use for temperatures far below zero to 800 F, for pressures from high vacuum to 750 psig.

TYPE CNE. For loading or transfer service. Capacities to 2,700 gpm. Heads to 500 ft.

TYPE HM. Available in 12 sizes. Capacities to 700 gpm. Heads to 475 ft. Up to 500 F.

TYPE HD. Hydraulically balanced double-suction impeller handles boiling liquids with low submergence. Capacities range from 600 to 3,200 gpm at heads up to 700 ft. To 850 F. and 550 psig.

engineer in 1953 and in this capacity aided in the field applications of newly developed Dowell oil-well services.

Crawford and Clem Join T. D. Williamson, Inc.

D. B. CRAWFORD

J. C. CLEM

Don B. Crawford, superintendent of production and purchasing agent, and James C. Clem, advertising and sales promotion, have been announced as staff additions by T. D. Williamson, Inc.

Crawford's engineering experience includes 7 years with Stanolind Oil & Gas Co., and 4 years as assistant chief estimator for Refinery Engineering Co.

Clem was associated with the distributive-education staff of Oklahoma A. & M. College at Stillwater. Prior to joining Williamson, he was chief draftsman for Instruments, Inc.

M. T. Works Resigns As Cameron's Chief Engineer

Madden T. Works has announced his resignation as chief engineer of Cameron Iron Works, Houston. He will do petroleum-mechanical-consultation work, specializing in drilling and production-equipment design.

Works has been associated with Cameron for more than 22 years, joining the company's engineering department soon after his graduation from Rice Institute.

Sargent Announces Line Of Production Equipment

V. A. KELLEY

Sargent Engineering Corp., for more than 30 years builders of deep-well pumps, has announced the addition of a line of production - equipment supplies to be sold through its 22 field stores.

V. A. Kelley, formerly Mid-Continent sales representative and representative of Bethlehem Steel Co. and Johnson-Fagg Engineering Co., has been appointed manager of production-equipment supplies for Sargent, according to the announcement by H. L. Sargent, vice president, oil-tool sales.

Kelley first joined Sargent in 1936 at Shawnee, Okla. He has been stationed at Tulsa, Dallas, Houston, and also has covered the West Texas and New Mexico territories.

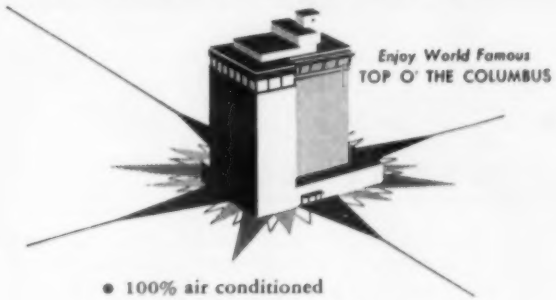
Shepard Made General Sales Manager, Ohio Injector Co.

W. G. SHEPARD

Appointment of William G. Shepard to the position of general sales manager for The Ohio Injector Co. has been announced by Harry G. Smith, administrative vice president. He will supervise sales activities for the company's domestic and foreign sales.

With Ohio Injector since 1945, Shepard has been district sales representative, and has worked in the company's home-office-sales department at Wadsworth, Ohio. He moves into his new post from the firm's Chicago office where he was division sales manager.

Tops for Business Trips!
THE COLUMBUS
Miami's Finest Hotel

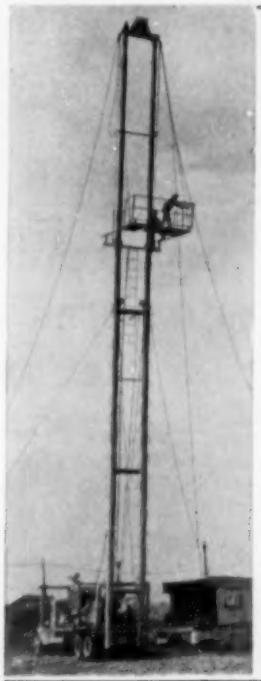


- 100% air conditioned
- Convenient to everything in downtown Miami
- Ticket office hub of all airlines serving Miami

17 floors up...fine cocktails and dinners...enjoy Miami's most spectacular view of Biscayne Bay through walls of glass.

THE Columbus HOTEL

Biscayne Boulevard at First Street, Miami, Florida C-8



S & R
Custom Built
PORTABLE TELESCOPING POLE MASTS—

This S & R double ladder mast is of heavy welded steel construction, and is fabricated of 10¾" pipe and 8⅝" pipe. Overall dimensions when erected 87 feet to crown support beam and 52' when telescoped in traveling position.

Approximate weight of the complete equipment is 12,000 lbs.

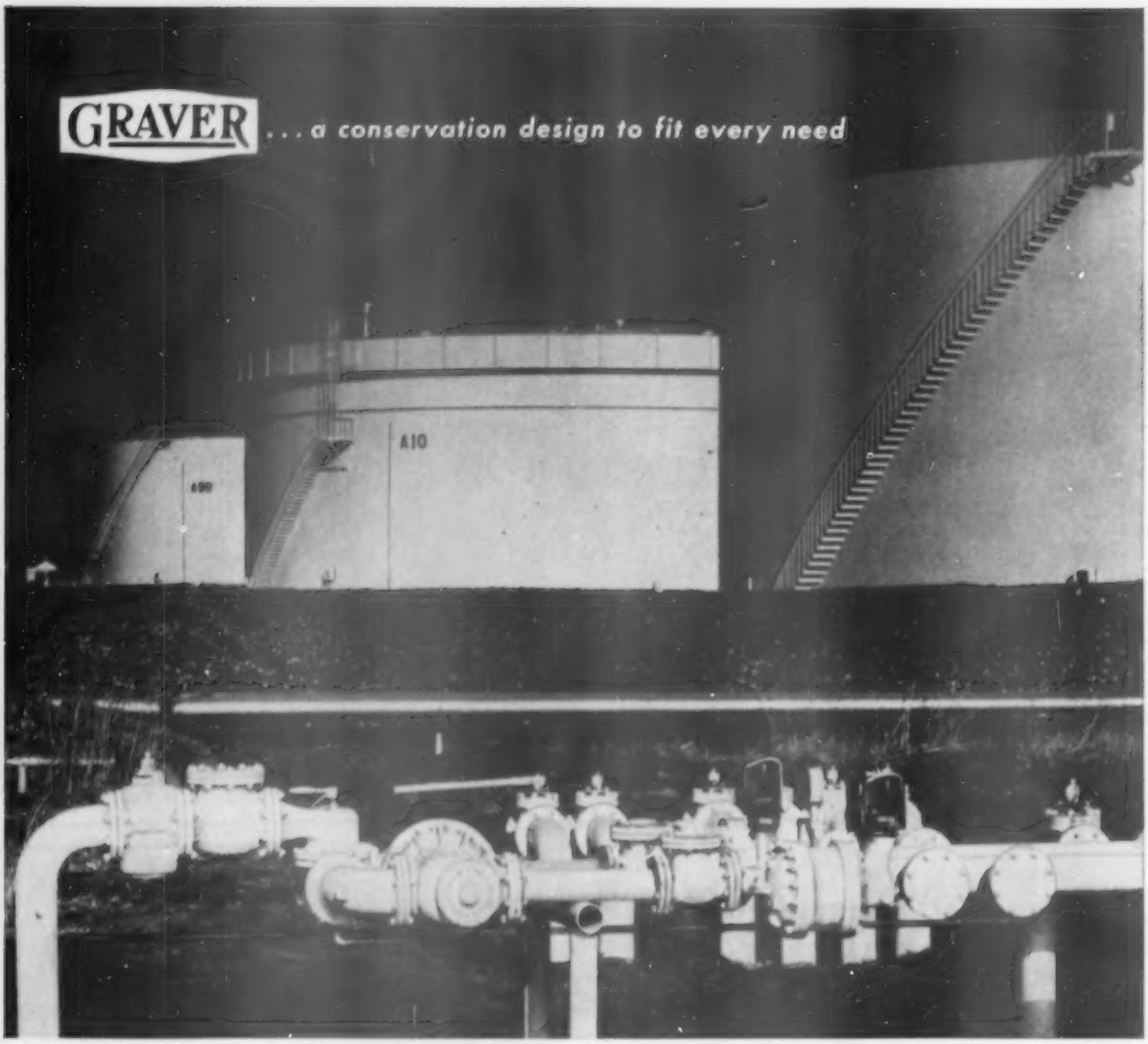
The complete assembly includes the (1) poles, (2) breakdown shaft assembly, (3) attached racking platform (which positions itself when poles are raised), (4) pole adjusting screws, (5) a sheave assembly to be mounted on truck or trailer for raising the poles, (6) and a four or five 24 inch sheave crown block for ⅞" line.

Available for truck, trailer, or skid mount.

For additional information write wire, or phone.

S & R TOOL & SUPPLY CO.
P. O. Box 1755 Houston, Texas

Export: 42 Broadway, N. Y. 4, N. Y.



SHELL

IN CHICAGO

Premium Gasoline with TCP Goes to Market...

FROM GRAVER TANKS

The volatility of Shell Premium gasoline with TCP is safeguarded for Chicago area customers by this 140′ by 40′ Graver Expansion Roof tank—the largest tank of this design in the world.

Shell's Premium gasoline, with TCP added at Wood River, Illinois, is shipped by Shell's Products Pipe Line to the new terminal at Argo, where it is protected against vapor losses in storage by the Expansion Roof. The variable vapor space provided by the movable roof retains the vapors of the gasoline in this tank and in a similar Graver cone roof tank manifolded to it. Thus, the automatic action of a single Graver Expansion Roof is conserving the volatile elements of 9,200,000 gallons of Shell Premium Gasoline with TCP.

The completion of this particular tank is doubly significant, for now not only has Shell in operation the largest Expansion Roof ever built, but also the first Expansion Roof ever built. This early unit, erected in 1939, has operated unfailingly for the past 15 years. Such service records have made Graver Expansion Roof tanks the overwhelming choice of those most concerned with proper conservation methods.

GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

CHICAGO • NEW YORK • PHILADELPHIA • EDGE MOOR, DEL. • ATLANTA • CATASAUQUA, PA. • PITTSBURGH • CLEVELAND • DETROIT
TULSA • SAND SPRINGS, OKLA. • HOUSTON • ODESSA, TEXAS • CASPER, WYO. • LOS ANGELES • FONTANA, CAL. • SAN FRANCISCO

In taking his new post, Shepard assumes responsibility for maintaining sales for one of the oldest producers of industrial valves in the field.

Shepard was general manager of Cleveland Press Steel Co. before World War II.

Harbison-Fischer Names Post to Fort Worth-Dallas

Byron Post has joined Harbison-Fischer Manufacturing Co., Fort Worth, as city office sales representative for the Fort Worth-Dallas area. He was formerly manager of Fort Worth area sales office of Oil Well Supply Division of U. S. Steel Corp. Harbison-Fischer manufactures and markets subsurface oil-well pumps and related production equipment. Post will make his headquarters in Fort Worth.

Mid-Continent Promotes Two to Store Managers

G. S. DURBIN

B. O. GIDDENS

G. S. Durbin has been appointed store manager of Bowie, Tex., outlet, while B. O. Giddens has been promoted from city salesman in Odessa, Tex., to store manager of the Eunice, N. M., location as announced by the general offices of Mid-Continent Supply Co., Fort Worth.

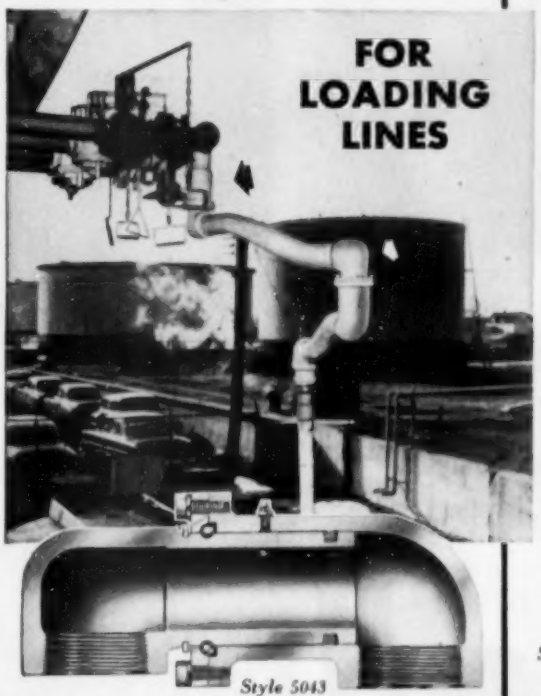
Durbin joined Mid-Continent in 1950 at the Wichita Falls, Tex., location. He transferred to the Bowie store as a field salesman.

Giddens worked briefly with Mid-Continent from 1944 to 1945 when he entered military service. He returned to the organization in 1949 at the Sundown, Tex., store and worked there until his Odessa transfer.

Elderkin Rejoins Muldrow As Section Supervisor

Gordon K. Elderkin, Midland, Tex., has rejoined Muldrow Aerial Surveys Corp. as supervisor of the controlled regional-base-map section, it was an-

BARCO Swing Joints



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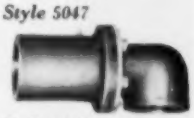

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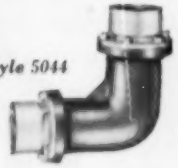

Style 5045

Style 5048

Style 5050

Style 5046

HERE is why users like BARCO'S new *all-steel* Swing Joints for loading and unloading gasoline, oil, lube oil, LP gas, petro-chemicals and other fluids:

BALL BEARING AND O-RING EQUIPPED—In Barco Swing Joints, the ball bearings do not fall out when joints are taken apart! Long bearing provides adequate pipe support. *Special O-ring seal eliminates frequent gasket replacement.* Seals on pressure or vacuum. Leakproof service over wide temperature range, −40°F. to 225°F.

LONG LIFE—New *"Bar-Moly"* dry lubricant process gives a permanent anti-galling, corrosive-resistant finish to moving parts. This, combined with routine lubrication, insures longest possible maintenance-free service.

EASY MAINTENANCE—Joints can be disassembled for inspection without disconnecting piping. O-rings are easily renewable in the field. Frequent greasing not required to maintain sealing.

MANY STYLES—The Barco line is complete with single swing, double swing, and counter-balance styles to meet every need. Sizes 2", 2½", 3", 4".

BARCO MANUFACTURING CO.
5391 HOUGH STREET
Barrington, Illinois
Worldwide Sales and Service

For complete information on Barco Swing Joints, ask for a copy of Catalog 400.

PROTECTION – WHERE ACCIDENTS BEGIN

BULLARD-BURNHAM SAFETY HOOKS

At last a 100% safe hook for every type of equipment; utility and chain hoists, horizontal tuggers, come-a-longs, cranes, block and tackle or snatch blocks. Safety gate automatically locks closed and cannot be disengaged accidentally. A touch of the finger releases the lock to open gate. If the hook is sprung, even ¼ inch, gate will swing free, warning workers. All hooks used are standard drop forged hooks with B & B safety gates of non-corrosive brass. Sizes available #2 through #16A. Return spring on gate is available at additional cost. Write for descriptive circular.

E. D. BULLARD CO.
SINCE 1898
SAFETY HOOK DIVISION
275 EIGHTH STREET
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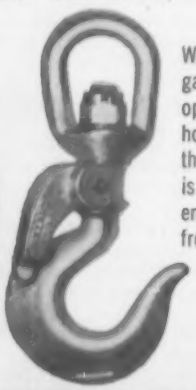

With gate open hook's throat is entirely free

EVERYTHING BULLARD IN SAFETY

T. M. REG. U. S. PAT. OFF.

nounced recently by Mrs. M. Ellison Mudrow, president.

Elderkin was formerly with the company from 1937 to 1950. During his previous employment he was engaged in building controlled regional base maps for the company.

Prior to his employment with Muldrow Aerial Surveys Corp., Elderkin was with the Coast and Geodetic Surveys-U. S. Government Controlled Surveys for 2 years. He also spent 1 year with the U. S. Army Engineers in flood control.

Barton Instrument Appoints Snyder Co. Representative

Barton Instrument Corp., Los Angeles, Calif., has announced the consolidation of its representation in oil, gas, and chemical field centers. Snyder Co., Inc., Houston, has been appointed sales and service representative of the Barton Flowmeter line, as well as related products, in the Mid-Continent and part of the Gulf Coast.

The services offered by Snyder Co., Inc., will cover all aspects in metering sales and service, including calibration and bench-work facilities. With its home office in Tulsa, Snyder Co. covers the critical territories with branches in Odessa, Houston, and Dallas.

J. M. (Jack) Ribble, district sales manager for Snyder Co., has a broad background of experience in this activity. His work with Phillips Petroleum Co. (natural-gas department) included supervisor of design in meters and controls in Phillips' defense plant from 1942 until 1951 when he was appointed supervisor of measurement and instrumentation.

Lane-Wells to Open New Branch at Bartlesville

To serve the increasing needs of northeastern Oklahoma fields, Lane-Wells Co. is opening a new branch in Bartlesville. This location was selected as the strategic center for quickest service to all parts of this area.

Robert D. Johnson, formerly gun-perforator operator at Perry, Okla., is in charge of the new location. Johnson, a veteran in oil-field service, has been with Lane-Wells since 1945.

Kenneth W. Simmons, formerly radioactivity operator at Oklahoma City, is district sales engineer. Charles

Another of 15 reasons why **REED** tool joints last longer!

PHOSPHATE-TREATED THREADS . . .

THE wearing threads of all **REED** Tool Joints are given a treatment during manufacture to prevent galling.

This treatment converts the surface of the threads into a complex metal phosphate.

During the critical breaking-in period, this surface acts somewhat like a lubricant that *won't squeeze out!*

It effectively prevents galling and premature failure of tool joints.

Phosphate-treated threads is just one of many reasons why **REED** Tool Joints last longer. See the back of this insert for some more reasons.

PESA

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REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

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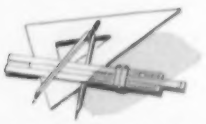
15 reasons why REED tool joints last longer!



Advanced design. The list of **REED** tool joint developments is assurance that **REED** Tool Joints contain all the latest improvements in design.

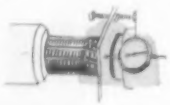
Chemical analysis of every heat of steel is checked by spectrograph.

Strength and toughness of every heat of steel are determined by three different testing machines.

Grain structure and grain flow are checked by microscope. **REED** Tool Joints meet the very highest standards.

Hardenability tests are made and form the basis for the "tailored" heat treatment of tool joints made from different heats of steel.

Precision machining is accomplished by specially designed automatic machines.



Jigs and fixtures of the highest precision assure perfect alignment and concentricity of **REED** Tool Joints.

Thread comparator checks hob used to cut **REED** Tool Joint threads, assuring accuracy of thread form, lead and taper.

Automatic heat treating furnaces—especially designed for the job—heat tool joints to utmost precision in a carefully controlled atmosphere.

This central control room enables the heat treat foreman to "tailor" the treatment of each heat of steel to extreme accuracy.

Precision quenching and drawing complete the "tailored" heat treatment that gives the best combination of strength and toughness to every tool joint.

Hardness testing is final assurance that every **REED** Tool Joint is strong and tough.

Tool joint threads are treated to prevent galling during breaking-in. Complex metal phosphate coating acts as a pre-lubricant infused into the threads.

"Reedite" hard facing—available on order—is factory applied to resist abrasion better and make tool joints last longer.

These hand gauges, plus comparators, master gauges, profilimeters, magnaflux and other machines, are used to make the 120 inspections each tool joint must pass.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

A. Berquist and Fred A. Soule, experienced Lane-Wells personnel, joined Johnson to staff the new branch.

B-I-F Industries Forms New Company in Texas

B-I-F Industries, Inc., Providence, has announced the formation of a new Texas division with sales and service offices in Houston and Dallas. It is known as B-I-F Texas, Inc., Southwest Division of B-I-F Industries, Inc. The move was made to provide increased accommodation and service to customers in the Southwest area.

B-I-F Texas, Inc., represents Builders-Providence, Inc., Omega Machine Co., and Proportioneers, Inc., manufacturers of meters, feeders, and controls for water and the petroleum and process industries.

The main office in Houston is staffed by John B. MacKenzie, Jr., a vice president of B-I-F Texas, Inc., Charles J. Wolfer, Raymond W. McIndoe, Jr., and Mrs. Lollie R. Lowe. The Dallas office includes Edward Morey, Jr., also a vice president of B-I-F Texas, Inc., Lewis H. Johnson, Jr., Mrs. Floy Brazell, all former members of the firm Morey & Morey who for 33 years represented B-I-F Industries, Inc., in the Southwest, Richard L. Lauderdale and Clem D. Hoye, Jr., who is the factory-trained serviceman for B-I-F Texas, Inc.

Harlin Made American Iron Manager, Manufacturing

Varney S. Harlin has been promoted to the position of manager of manufacturing and engineering as recently announced by American Iron & Machine Works Co. In this capacity, Harlin will be in charge of all plant operations, engineering, and research both at the main plant and the tool-joint installation plant, both in Oklahoma City. This June marked Harlin's twentieth anniversary with American Iron. He is shown above right being presented his service button by M. G. McCool, president. Harlin has served in various capacities during his 20 years with American Iron and previous to his current promotion held the position of chief engineer for 14 years.

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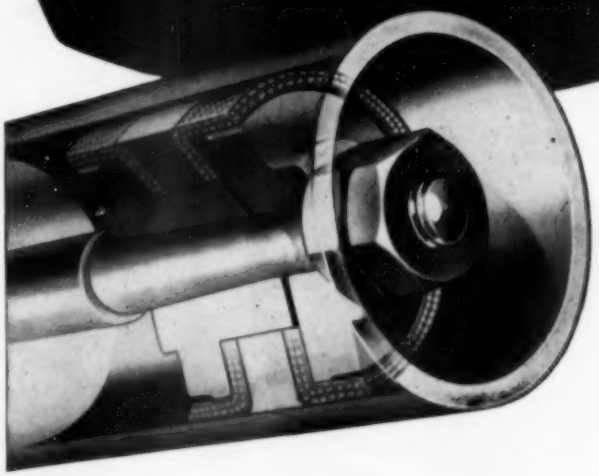

THERE are two basic, well-proved reasons why more and more Darcova Pumcups are going into cylinders of air and hydraulic controls and mechanisms.

First, texture-engineered Pumcups outlast most other piston packings at least 3 to 1. There's less replacement, less down-time!

Secondly, efficiency *does not diminish* as Pumcups wear. Response is always faster, surer, with less power consumed!

Darcova Pumcups are available in sizes and engineered textures ideal for virtually any service. Why not find out what they can save *you?*

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DARLING VALVE & MANUFACTURING CO.

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PUMCUPS

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*DRISCOSE is a trademark for Sodium Carboxymethylcellulose.

EXPLORATION

Powder River Basin . . . Land of Promise

by Frank J. Gardner

TAKE a large basin (32,200 sq. miles in area); roll out 96,600 cu. miles of sedimentary strata (largely marine) to a thickness of 16,000 ft., and line the basin throughout. Knead and fold outer edges until well deformed, leaving center of basin relatively undisturbed. Add oil-saturated Cretaceous-sand lenses enclosed in marine shales and sprinkle edges of basin with generous amounts of oil seeps and strat traps. Age for 450 million years and serve hot to Rocky Mountain oil industry.

That's about the best recipe yet concocted to tempt the petroleum palate, and to intrigue an oil hunter.

Powder River active . . . The Powder River basin fills the bill. Since 1889, it has presented an intoxicating challenge to Rocky Mountain explorers. With its structural complexities, multiple pay prospects, and varied trap types, it has tempted the drill perhaps more than any other western province. It has blown hot and cold, but consistently has been the most active of the Wyoming basins since the turn of the century. As a rule, however, the activity at any one time has been limited and concentrated on one flank or the other. This year and last, it's been the southeastern flank, where whirling rotaries in the Greater Clareton fields have set new records for Rocky Mountain drilling. This is immediately evident from a glance at any wildcat map of Wyoming; clusters of active wildcats and outpost wells center around previously productive fields of Weston, Niobrara, and Converse counties. It is here that the basin exhibits its least structural complexity. Here are the strat traps found only by drilling and daring.

The new potential . . . But the new potential of the Powder River will rest upon results of the true "rank" wildcats drilling on its northern, western, and northeastern flanks. New and deeper reservoirs are being opened on the great Cedar Creek anticline; at least three remote wildcats are probing the north flank of the basin; and on the western edge, Shell Oil Co. has found a new Upper Cretaceous pool just southeast of Ash Creek field (arrow on map).

This is carrying exploration full circle around the perimeter of Powder River. This northern and western rim is not nearly as well known to Rocky Mountain geologists as the eastern parts of the basin, but new tests, new strikes, and new risks may well lead to numbers of new fields along the Ash Creek-Sussex strike.

The Powder River basin, second largest in the Rocky Mountains, has yielded a second oil pool on its western flank at Ash Creek.

A new discovery on the west . . . Shell's discovery, 1 Hallworth (SE NE NE 31-58n-84w), lies in Sheridan County, Wyoming, 2½ miles southeast of Ash Creek, the only producing Powder River basin field within a radius of 100 miles. Distances from other "nearest fields" are shown on the map, but by curious coincidence, all of them are off production, or are producing only at intervals. Operators at 1 Hallworth found oil in the Ash Creek (Shannon-Upper Cretaceous) sand at 4,900 ft.; this is about 400 ft. deeper than production in Ash Creek field itself. On the latest reported test, the wildcat flowed 25 bbl. of oil per hour, and tests are continuing, as Shell nears the pay in a southwest offset, the 2 Hallworth, for confirmation of the find.

Ash Creek was found in 1952 by J. Ray McDermott on a Shell farmout; it was the first commercial oil discovery in the entire northwestern part of the basin and was considered one of the most important discoveries of the year. The first well pumped 200 bbl. daily from Shannon sand at 4,500 ft. Its success was attributed to detailed surface, seismic, and core-hole work.

Others to come . . . The structure at Ash Creek is indicative of the type of field one might expect on the west flank of Powder River basin—small faulted structures (400 ft. of closure, 800 proven acres), relatively thin sands, and fair to favorable reservoir properties. Finding them involves good surface work and accurate geophysics, for unlike the eastern flank, this side of the basin is characterized by strong deformation and faulting. Local overthrusts and overturning are common, and the most pronounced faulting lies in the area between Sheridan townsite and Billy Creek field in front of the Big Horn Mountains (see map).

Perhaps the Shell discovery at 1 Hallworth is not world-shaking, but it's an indicator—a harbinger of the type of discovery that lies in store for the Powder River basin. This is a big basin, second only to Williston in size. Like other Rocky Mountain basins, it is asymmetrical, and its deepest portion hugs the mountain range to the west. To the east, it is broad and rather simple; the eastern edge is almost monotonous from the folding standpoint.

But it offers multiple shallow pays, hundreds of folds and faults on the west, unlimited strat trap possibilities in the Cretaceous on the east, and in the center, broad, simple uplifts that extend promise of Pennsylvanian and Mississippian fields yet untouched.

The recipe is piquant. And oil men are nothing if not gourmets.

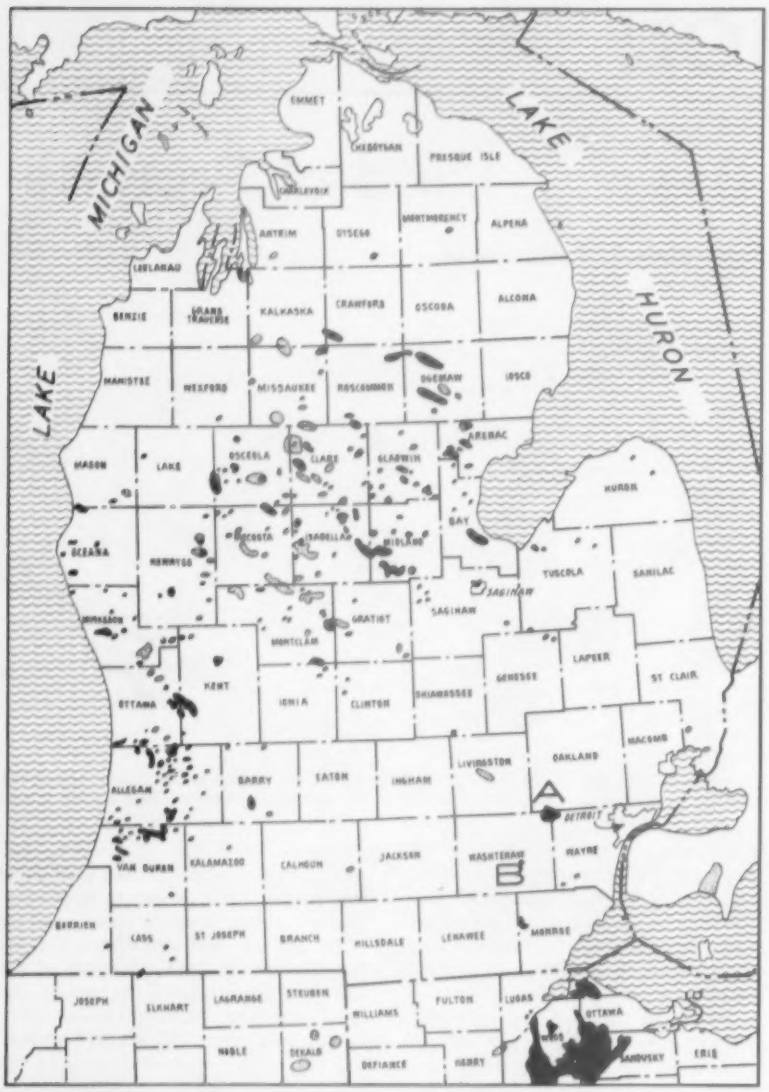

Fig. 1—Recent discoveries in the Northville and Freedom fields (A and B on above map) have touched off an active drilling and leasing campaign on the southeast edge of Michigan basin.

Michigan Hopes Rise With Three 1954 Discoveries

Trenton production in Washtenaw County has rejuvenated drilling in the Wolverine State, and this zone may become an important oil-producing reservoir

by Lee S. Miller

ONE minor and two major oil discoveries during 1954 in Washtenaw County in southeastern Michigan, one almost at Detroit's back door, have created excitement in Michigan oil circles, and have put geologists to restudying their structural ideas relating to the area.

The outstanding discovery and the one that has led to most active follow-up drilling is William C. Taggart's Trenton formation discovery on the Roy V. LeMasters farm in the extreme northeastern corner of the county.

A development that holds promise of equal importance is Sun Oil Co.'s Trenton oil well on the Niehaus farm in Freedom Township, 25 miles southwest of the Salem Township pool.

Both these new Trenton pools (Fig. 1) justify hope that the formation, until now a minor prospect, may become one of Michigan's most important sources of oil. The third Washtenaw County discovery was in Bridgewater Township in the southwestern part of the county, 10 miles south of Sun's Trenton well. This well, also drilled by Taggart, produced from the Traverse formation for less than 3 months before abandonment, but it did prove that under favorable structural conditions the Traverse, now producing extensively in other parts of the state, may produce in eastern and southeastern counties.

Northville Field

Taggart's LeMasters well in Section 1 of Salem Township was completed in late January as the state's first important Trenton producer, at a depth of 4,397 ft. (Fig. 2). Trenton was topped at 4,247 ft., and while small oil and gas shows were found as high as 4,274 ft., the big pay was not found until 4,386 ft., and the largest production came at from 4,394-97 ft. Well was bottomed at 4,397 ft.

Dolomite reservoir . . . Observations on this and on followup wells show that oil and gas saturation is controlled by dolomitization in this Trenton formation, generally classified as limestone. After several weeks of testing, regular production was established at about 625 bbl. of oil daily, flowing through a very restricted choke. Gas-oil-ratio averages about 575 cu. ft. per bbl. Full possible productive capacity has not been determined. Some indication of potential may be found in the fact that with an original reservoir pressure of about 1,200 psi. the pressure drawdown was only about 1 lb. for each 50 bbl. of production.

The second completion in the pool was Edward Torosian's 1 Nerreter, located about 1 mile west-northwest from the discovery. This well topped the

Trenton at 4,095 ft., 175 ft. higher structurally than the Trenton top in the discovery. It entered the big gas pay at 4,198 ft., 219 ft. higher subsea datum than oil in the discovery. Oil pay came at 4,509 to 4,530 ft. Top of the oil was 92 ft. lower subsea than top of oil in the discovery. Well drilled into water at 4,536 ft., 3,552 ft. subsea datum, and was plugged back to 6 ft. above the water.

A direct 660-ft. north offset to Taggart's discovery topped the Trenton 42 ft. lower sea-level datum and bottomed out 299 ft. lower sea-level datum than the discovery. No oil or gas was found, but water was encountered 230 ft. below Trenton top. Failure to find oil or gas was due to lack of dolomitization till water was reached. The west offset to the producer reached Trenton top 3 ft. higher, encountered oil 30 ft. higher, and was bottomed out 21 ft. lower structurally than in the discovery.

Including dry holes, producing wells, wells in process of completion, and wells to be deepened, 18 holes have been drilled into the Trenton. Four wells are oil producers. At least six are apt to be drilled deeper in the Trenton, some with assurance of production and all with possibilities. As many as six of the wells drilled may be written off as dry holes, apparently because of lack of porosity. Two of the wells that should become producers were drilled several years ago, one in 1937, with small flows of gas in the Salina-Niagaran sections. The 1937 well is the highest in the field on top of the Trenton. Three wells drilled several years ago in the field found small shows of gas in the Dundee.

Prominent trend . . . All wells drilled into the Trenton have contributed important structural and other data. It is now satisfactorily established that the structure is a rather sharp anticlinal fold with a northwesterly-southeasterly trend (Fig. 2). Porosity is a result of dolomitization, with crystalline and vugular crevices that are irregular both vertically and horizontally. The dolomitization and the resulting porosity are probably more liberally concentrated close to the anticlinal crest where folding stresses have created crevices that have encouraged dolomitization. Gas, oil, or water is present only where dolomitized porosity permits accumulation.

Oil is saturated with gas at pressures considerably less than the reservoir pressure of about 1,800 psi., and an extensive free gas cap is present in higher sections of the reservoir. Bottom water is present and is furnishing an effective drive agency. Where porosity conditions permit, gas may be present at

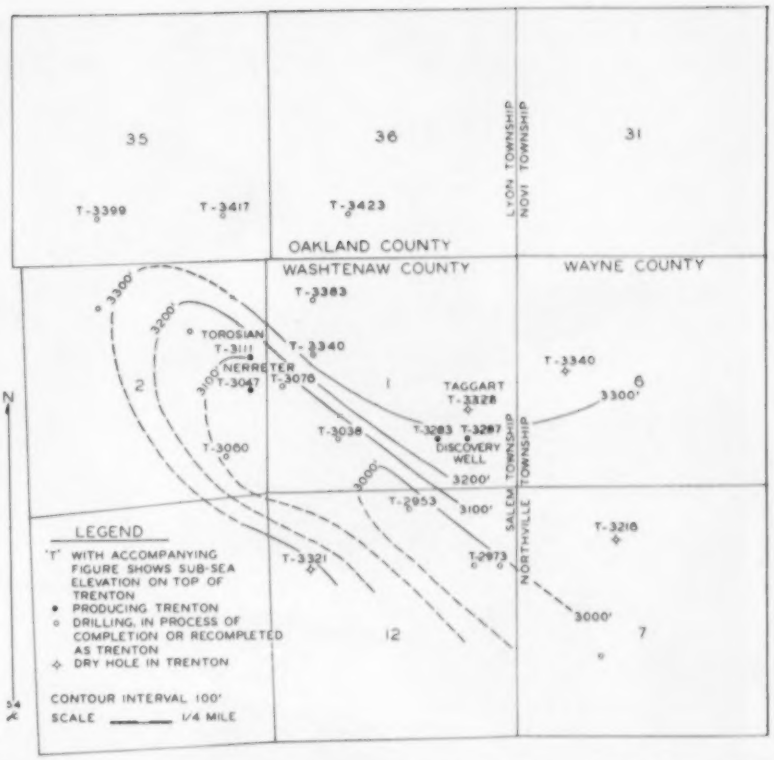

Fig. 2—Although Northville is a prominent anticlinal trend, Trenton production is partially controlled by dolomitization of the limestone.

subsea elevations above 3,425 ft., oil at between 3,425 and 3,550 ft., and water below 3,550 ft. As much as 450 ft. of Trenton has been drilled and this is close to its total maximum thickness in the area. It is probable that some of the production in the deepest wells is from the Black River which is grouped lithologically with the Trenton.

Proration necessary . . . Studies of producing wells have shown that even though they may have large oil-production potentials, water drive is not sufficiently active to permit water ingress to the reservoir at a rate that would replace large-volume evacuation of oil with its dissolved gas. Good conservation would dictate restricted oil-production rates to prevent gas-cap gas breaking through into the oil-bearing section, with assurance of consequent bypassing and ultimate loss of oil. The operators voluntarily restricted production to 200 bbl. of oil per well per day in the four producing wells in early August.

By order of Michigan's supervisor of wells, production in the field has now been restricted to 200 bbl. of oil per well per day. Further control action could be taken following public hearings.

Drilling activity is picking up speed and the number of producing wells will be greatly increased within the next few months. Lack of Trenton dolomitization in some wells in favorable structural positions will result in dry holes.

The discovery well was drilled by rotary tools and this will be favored in the field. Less than 1 month is required to drill to the Trenton with rotary. Cable-tool drilling has been successful and will have a fair share in development.

At present, oil is being purchased and transported by tank truck to a Detroit refinery.

Fig. 2 is a map of Northville Trenton

THE AUTHOR

Lee S. Miller, petroleum consultant, East Lansing, Mich., has been active in petroleum-engineering work for over 32 years. From 1922-1926 he was associated with the federal Government as a natural-gas engineer. He served Carter Oil Co. as natural-gas superintendent for several years, prior to his entering consulting work in 1932. For the past 15 years Miller was in charge of reservoir research and proration engineering for the Michigan Geological Survey. He is now consulting engineer, specializing in Michigan activities.

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The care used in packaging Link-Belt API Chain is typical of the added refinements used in its manufacture. Four of these engineering extras are shown below. For the complete story, get Book 2580 on Link-Belt oil field equipment. And for prompt, expert service, call your nearest Link-Belt office or any leading supply store in your field.

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LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 12.640

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COTTERS have patented grooved shank affording tight fit in pin hole. Yet pin is easily removed or inserted. Cadmium plated.

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"PERMO-CARBONIFEROUS"	"RED-BEDS"	SHALE, CLAY, SANDY SHALE, gypsum		
PENNSYLVANIAN	GRAND RIVER	SANDSTONE, sandy shale	80-95	BUILDING STONE, FRESH WATER
	SAGINAW	SHALE, SANDSTONE, limestone, coal	20-535	SHALE, COAL, FRESH WATER, BRINE, GAS
MISSISSIPPIAN	BAY PORT	LIMESTONE, SANDY OR CHERTY LIMESTONE, SANDSTONE	2-100	LIMESTONE, FRESH WATER
	MICHIGAN	SHALE, gypsum, anhydrite, sandstone	0-500	GYPSUM
	"MICHIGAN STRAY"	SANDSTONE	0-80	GAS
	MARSHALL	SANDSTONE, sandy shale	100-400	FRESH WATER, BRINE, BUILDING STONE
	COLDWATER	SHALE, sandstone, limestone	500-1100	SHALE, FRESH WATER
	SUNBURY	SHALE	0-140	
	BEREA-BEDFORD	SANDSTONE, SHALE	0-325	GAS, OIL
	ELLSWORTH-ANTRIM	SHALE, limestone	100-950	SHALE, GAS
DEVONIAN	TRAVERSE	LIMESTONE, SHALE	100-800	LIMESTONE, OIL, GAS, FRESH WATER
	BELL	SHALE, Limestone	0-80	SHALE
	ROGERS CITY-DUNDEE	LIMESTONE	0-475	LIMESTONE, OIL, GAS, FRESH WATER
	DETROIT RIVER	DOLOMITE, limestone, salt, anhydrite	150-1400	LIMESTONE, DOLOMITE, OIL, GAS, SALT, BRINE, FRESH WATER
	SYLVANIA	SANDSTONE, SANDY DOLOMITE	0-550	GLASS SAND, FRESH WATER
	BOIS BLANC	DOLOMITE, CHERTY DOLOMITE	0-1000	
SILURIAN	BASS ISLAND	DOLOMITE	50-570	DOLOMITE, FRESH WATER
	SALINA	SALT, DOLOMITE, Shale, anhydrite	50-4000	SALT, GAS, OIL
	NIAGARAN (Guelph-Lockport-Engadine) (Manistique-Burnt Bluff) (Cataract)	DOLOMITE, Limestone, shale	150-800	LIMESTONE, DOLOMITE, OIL, GAS, FRESH WATER
ORDOVICIAN	CINCINNATIAN (Richmond) (Maysville-Eden)	SHALE, LIMESTONE	250-800	
	TRENTON-BLACK RIVER	LIMESTONE, DOLOMITE	200-1000	OIL, GAS, LIMESTONE, FRESH WATER
	ST. PETER	SANDSTONE	0-150	FRESH WATER
OZARKIAN OR CANADIAN	PRAIRIE DU CHIEN	DOLOMITE, Shale	0-410	
	HERMANSVILLE	DOLOMITE, SANDY DOLOMITE, sandstone	15-500	
CAMBRIAN	LAKE SUPERIOR (Monising) (Jacobsville)	SANDSTONE	500-2000	BUILDING STONE, FRESH WATER
ALGONKIAN	KEWEENAW (Copper formations)	LAVA FLOWS, conglomerate, shale, sandstone	9800-35000	COPPER, SILVER, ROAD METAL, SEMI-PRECIOUS GEM STONES
	KILLARNEY GRANITE	GRANITE, GNEISS, diorite, syenite		
	HURONIAN (Iron formations)	SLATES, HEMATITE, SCHIST, QUARTZITE, GRANITE, marble, dolomite	2000+	IRON ORE, ROOFING SLATE, ROAD METAL, GRAPHITE, MARBLE
ARCHEAN	LAURENTIAN	SCHIST, GNEISS, GRANITE		ROAD METAL, BUILDING STONE, VERDE ANTIQUE, TALC, GOLD
	KEEWATIN	SCHIST, GREENSTONE, SLATE		ROAD METAL

Fig. 3—Stratigraphic section of the Michigan formations shows the important oil and gas reservoirs. Prior to the discovery of Northville field, the Trenton formation was not considered as an important producing zone.

oil field showing well locations and structural contours on top of the Trenton. Changes in structural concept will be necessary as drilling continues.

Fig. 3 is a columnar section for the Michigan basin. The higher formations are present only in the deepest central portion of the basin in Clare and Gladwin counties. In Northville and in Michigan's other southeastern counties the Antrim, lowest Mississippian formation is the highest formation outcropping under the glacial drift. The glacial drift is 300 ft. or more thick in the area.

Freedom Field

Sun Oil Co.'s Trenton discovery well on the Neihaus farm in Section 8 of Freedom Township was completed in mid-August 1959 at a depth of 4,038 ft. Trenton top was at 3,771 ft., gas was encountered at 3,919 ft., and oil pay with a show of water was at 3,962-63 ft. After acid, well flowed 100 bbl. of oil with 70 bbl. of water per day, settled production. Trenton top in the Neihaus is at subsea datum of 2,825 ft., which is 145 ft. higher than at the highest well at Northville. More drilling will be required to show whether the difference is due to regional or to local structural conditions. Such scattered drilling data as are available suggest possible closures in Freedom as favorable as in Northville.

Earlier in the year Sun drilled a well a little over ½ mile north of the discovery but abandoned the hole in the Detroit River formation at 1,378 ft. Sea-level elevations on top of upper formations were about 35 ft. higher than in the Trenton discovery well, indicating possible structural rise in that direction. The company has now started a new Trenton objective well about halfway between the two older wells.

W. C. Taggart drilled a well to the Trenton formation in Section 28 of Bridgewater Township on the Charles Curtis farm in November and December 1953, reaching Trenton top at 3,349 ft. and bottoming out dry at 3,600 ft. A very promising show of oil was cased off in the Traverse, but was not recovered in plugging back after the Trenton failure. Two more nearby wells were drilled to the Traverse during January 1954. One was dry and the other was a very small and short-time producer. After making only 1,500 bbl. of oil, it was plugged in March. In the Traverse producer, production was at 980 to 986 ft., 129 to 135 ft. subsea datum.

In an early flurry of interest caused by the Traverse show in the Trenton test, 14 followup wells were drilled within a radius of 1½ miles of the discovery but none found oil or gas. Most were bottomed out in the Traverse, but several were drilled to the Dundee or Detroit River. No interesting structural indications resulted. Drilling interest lasted less than 5 months and there is no present activity in the area. It is notable that the Trenton top was logged nearly 300 ft. higher subsea elevation than at Sun's Freedom Township discovery. This is about the normal rise to the southward from the center of the Michigan structural basin and toward its southern rim along the Kankakee arch.

The actual net Bridgewater accomplishments were the demonstration that the Traverse could become a producer in this section of the state, and the accumulation of data that could help solve structural problems relating to the Trenton or other formations.

Trenton Prospects in Michigan

The only other Trenton oil pool in Michigan is Deerfield in Monroe County, about 25 miles south of Northville pool. The pool was discovered in 1920 and 35 wells were drilled, proving an area of 350 acres. Cumulative production to end of 1953 was 553,000 bbl. Present daily average production is 13 bbl. of oil and 13 bbl. of water. There are now 15 wells in producing status.

Three Trenton wells drilled in 1941 and 1943 in Sumpter and Huron townships, about 20 miles south of Northville field, produced a total of 2,570 bbl. of oil before abandonment.

In the early part of the present century the Trenton produced oil and gas in important volumes in northern Ohio, just south of Toledo and only 30 or 40 miles from Michigan's Deerfield pool. The Cincinnati arch was the controlling structural influence responsible for Ohio's Trenton production. This same regional feature has also had an important structural influence on the Michigan basin and on the anticlinal folds that are known to radiate northwestward from the Cincinnati arch across the basin. Extensive new exploration along these folds throughout the state is in prospect. In the central portion of the basin in Clare and Gladwin counties, depths to Trenton top may be as much as 11,000 ft.

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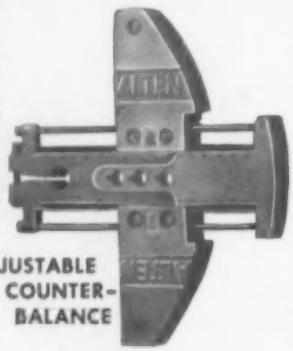
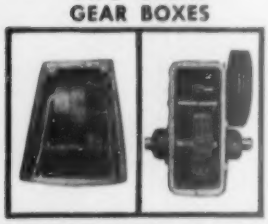


TWO GREAT GEAR BOXES



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Morrow Testing Begins At Beaver County Strike

American Gas Producing Co. 1 Shadden, SE SE 26-3n-24eCM, 1 mile southwest of Southwest Camp Creek field, is testing after a gas flow was reported from perforations at 7,280-99 ft. in the Purdy sand.

The well also indicated Douglas sand (Pennsylvanian) production on a drill-stem test at 5,489-5,503 ft.

East Sturgis area . . . The fourth oil producer in this new area which is off the east flank of Cimarron County's Keyes field has been completed at Cabot Carbon Co. 2 State of Oklahoma "B," SE NW NW 30-5n-10eCM.

It pumped 108 bbl. of 39°-gravity oil daily natural from perforations at 4,276-84 ft. in the lower Purdy (Pennsylvanian) sand.

Shell Oil Co. 1-A Williams, SE SW NE 30-5n-10eCM, has indicated production from the middle Purdy sand at 4,275-93 ft.

Texas County . . . Shell Oil Co. is waiting for potential at a new oil strike on the northeast side of Keyes gas field in Texas County.

The 1 State "B," NE NE SW 30-6n-10eCM, flowed 212 bbl. of oil and 1,210 M.c.f. of gas per day on ½-in. choke from Keyes sand perforations. The well is about 2¼ miles southeast of nearest oil production. Shell has another small well at 1 Meade Unit, NE NE SW 27-6n-9eCM.

Dallam Opener Shut In After Testing

The first producer for Dallam County in the northwestern part of the vast Texas Panhandle has been shut in as a Cisco-Pennsylvanian gas discovery.

The well, Humble Oil & Refining Co. 1 Kerrick gas unit, Section 16, Block 50, H&TC Survey, 3 miles southwest of Kerrick, flowed an estimated 6,000 to 8,000 M.c.f. of gas daily through casing after acidization of perforations at 3,564-82 and 3,594-3,624 ft.

The new strike is located 7 miles west of Stratford-Pennsylvanian field.

Final Gage Taken at Greenwood Oil Offset

Final gage has been taken to the confirmation and southeast offset to Greenwood field's only oil producer. J. M. Huber Corp. 2 U.S.A. "C," 29-34s-43w, Morton County, Kansas, made bomb-test potential of 656 bbl. of oil per day from new Miocene pay zone.

The oil discovery at Greenwood was Stanolind Oil & Gas Co.'s 1 U.S.A. "C," with production from the lower Purdy sand.

Ford County, Kansas . . . The 1½-mile south outpost to the discovery of South Pleasant Valley field in Ford County is shut-in after assuring extension of the field.

It is Coppinger's 1 Kirkpatrick, SW NW SE 11-28s-21w. It flowed 3,800 M.c.f. of gas per day from Mississippian perforations at 4,986-5,014 ft.

Palo Duro Basin Wildcat Staked

Tule Production Co. has staked location for a 7,500-ft. wildcat test 40 miles south of nearest production in Panhandle field, Texas.

The 1 D. M. Cogdell will be located in

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	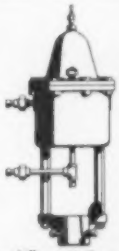			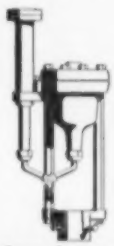
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26	Forged Steel	5000	100"—400"

*Type 27U is a uniform flow scale meter used for steam and other service where demand fluctuates widely. 100" range. Max. W. P. 2000 psi.

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Section 62, Block A-1900, Scrap File Survey 2518, 18 miles north of Silverton in Briscoe County. The area in which the test is located is separated from the Anadarko basin by the Amarillo Mountains.

Hartley Wildcat Begins Pump Testing In Granite Wash

The important new discovery in Hartley County, Texas Panhandle, has begun pump testing after assuring first production for the Dalhart basin.

Standard Oil Co. of Texas 1 Ernest Guilloud, Sr. pumped 246 bbl. of load oil, 21 bbl. of new oil and some salt water on 48-hour gage from 6,164-86 ft.

Maps Available

Mitchell Reproduction Co., 701 Fort Worth National Bank Building, Fort Worth, has three ownership maps of great value to the interesting developments in the Texas Panhandle. The counties covered separately are: Hemphill, Hansford, and Roberts. Scale: 1 in. equals 4,000 ft.

KENTUCKY

EASTERN KENTUCKY

In Breathitt County, United Fuel Gas Co.'s wildcat 8284 Elizabeth Gross topped Big lime at 726 and Berea at 1,372 ft. Corniferous lime was encountered at 1,625 ft. with oil from 1,627 to 1,631 ft., 1,752-1,760 ft., and 1,786-1,794 ft. Total oil was estimated at 3 bbl. natural and operators plan to sandfrac. Total depth is 1,820 ft.

On Rockhouse Creek in Martin County, Kentucky West Virginia Gas Co. has completed a good Mississippian Maxon sand well at their 6218 Carlisle Lands. Maxon, topped at 1,188 ft., had gas from 1,192-1,193 ft. showing an open flow natural 989,000 cu. ft. of gas daily. Total depth 1,202 ft.

APPALACHIAN AREA

WEST VIRGINIA

Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. U. S. A. I-1202 rank wildcat, elevation 3,036 ft., recorded the Onondaga at 4,648 ft., chert at 4,703 ft. and shut down at 4,707 ft., to run casing. In Roaring Creek district 514 L. M. & H. Talbott, elevation 2,411 ft., is drilling at 3,348 ft. Nollem Oil & Gas Corp. 1 Phares & Maxwell, elevation 2,438 ft., gaged 2,066,000 cu. ft., gas, Fifth sand 1,972-2,003 ft., gas 1,981 ft. TD 2,008 ft.

Randolph County, Roaring Creek district Nollem Oil & Gas Corp. 1 Phares & Maxwell, elevation 2,438 ft., 2,066,000 cu. ft. gas, Fifth sand 1,972-2,003 ft., gas 1,981 ft. TD 2,008 ft.

OHIO

A third Berea sand gas pool has been found in Clay Township, Tuscarawas County. David Ferguson et al 1 W. F. Miller, Lot 10, topped the second sand at 896 ft. and drilled in to 900 ft., where it gaged 625,000 cu. ft. natural.

The original pool was extended a location to the east by the Blackston et al 4 Gooding, Lot 10. Berea sand at 978-984 ft., still in sand, gaged 1,100,000 cu. ft. natural.

Mid East stepped out ¾ mile south of West Carlisle pool and brought in a 130-bbl. producer with 500,000 cu. ft. gas. On 1 Samuel Moore, Section 8, Pike Township, Coshocton County, Clinton was found at 3,228-3,264 ft. with 100,000 cu. ft. gas and 10 bbl. oil natural.

PENNSYLVANIA

In Connellsville Township, Fayette County, Southwest Pennsylvania, Peoples Natural Gas Co. 4030 F. K. Buttermore heirs, recorded the Onondaga at 8,880-8,900 ft., chert 8,894 ft., Oriskany sand 9,069 ft., and drilling at 9,087 ft. In Salt Lick Township, Mid Atlantic Oil & Gas Co. 1 Adolph Dupre, shut down at 8,194 ft., in the chert, reached at 8,191 ft. Cherry Hill Township, Indiana County, Chestnut Ridge Oil & Gas Co. 3, Ralph White, topped the Oriskany sand at 7,923 ft., drilling at 7,965 ft.

LOUISIANA

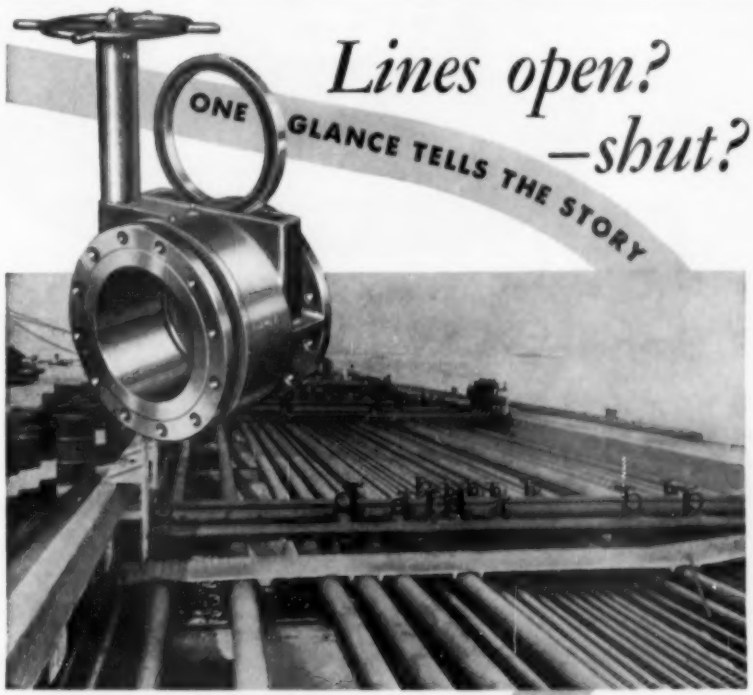
SOUTH LOUISIANA

Third Pay Zone Opened At East Lake Palourde

East Lake Palourde field, in Assumption Parish, got its fourth well and third producing zone with completion by California Co. of its 1 Lutcher-Moore with gas-condensate production from pay interval, in Miocene sand, at 12,538-606 ft.

Production was gaged at 5,700,000 cu. ft. of gas and 50 bbl. of condensate per day through ¼-in. choke. Pressure was 4,500 psi.

It is California Co.'s first well in the field,



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opened last April by Union Oil Co. of California. Union has two oil wells producing from an 13,380-ft. sand, and one gas-condensate well completed in a 13,150-ft. sand.

Rig from California Co.'s well, located northwest of the discovery well, has been moved to a location east of production for the company's second test. Union has two active operations.

New Condensate Discovery

Shell Oil Co. has a new gas-condensate discovery well at its 1 Schwing in southwestern Iberville Parish. Preliminary tests with casing perforated at 10,974-80 ft. recovered condensate at the rate of 95 to 100 bbl. per day flowing through 10/64-in. choke. Gas flow was ungaged. Location is approximately 5 miles southwest of Sullivan's Lake field, nearest production.

Old Dry Hole Reworked As New Discovery Well

New gas-condensate production has been opened northeast of Iota field, in northwestern Acadia, where Tamborello & Rasberry, of Houston, went into an old dry hole and got a flow of 59 bbl. of 62.9°-gravity condensate and 1,450,000 cu. ft. of gas per day through 12/64-in. choke from a sand interval at 9,407-13 ft.

The well, 1 Andrepont-LeJeune, was drilled to 9,520 ft. in 1950. Present operators deepened to 9,917 ft., then plugged back and perforated in the present zone, above the original total depth. Flow was under pressure of 2,350 psi.

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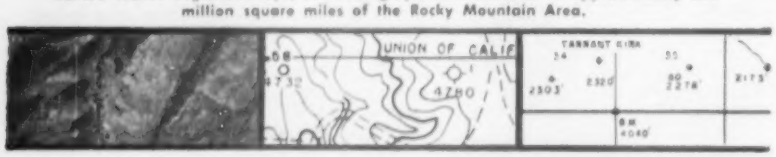

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NORTH LOUISIANA

Casing Set for Tests At Longstreet Area Wildcat

Testing is due at Jack W. Grigsby 1 Schuler estate, DeSoto Parish Crane zone of the Pettit prospect 2⅛ miles southeast of Longstreet field.

The Pettit possibilities were found on drill-stem test at 6,487-6,513 ft. Nearest Pettit production is 5 miles northwest in Longstreet field. The strike is apparently located on a trend of Pettit production extending from South Hallsville field in Harrison County, East Texas through Carthage and Bethany and into Bethany and Longstreet fields, Louisiana. The distance between the Grigsby wildcat and South Hallsville field is about 45 miles.

OKLAHOMA

Lincoln Dry Hole Becomes New Producer

Turning dry holes into producers seems to be a habit in Lincoln County on the Central Oklahoma platform.

Lee Evans 1 Turner, SE NW SW 23-15n-3e, flowed oil in excess of 150 bbl. per day from perforations at 3,370-80 ft. The pay sand was acidized and fractured. It flowed 31½ bbl. in 5½ hours on ⅞-in. choke; then it flowed 115 bbl. in 18½ hours on ⅞-in. choke. The operator is testing on 5/32-in. choke. The producing zone is the Cleveland sand, topped at 3,363 ft.

The new producer is in SE NE SW 23-15n-3e. It lies about 1 mile west of an oil well; it is about 1 mile east of North Sweet Home pool.

Osage Activity

A wildcat is planned 3 miles east of Burbank field in Osage County. It is E. L. Cox's 1 Osage, SW SW NE 5-26n-7e. There is a gas field between the wildcat and Burbank field.

The Indian Agency announces that Oklahoma operators have added 8 new completions in the county and 15 new locations.

West Little Chief pool continues active with a good well at Oliphant 5 Osage, NE NW NW 32-26n-6e. The well flowed 210½ bbl. of oil on ½-in. choke in 3½ hours. O. A. Shaw has good wells at 1 Osage, SE SE NE 20 and 2 Osage, NE SE NE 30. The 1 well flowed 102 bbl. hourly on ¾-in. choke; the 2 well got 86 bbl. hourly on ¾-in. choke natural.

Gas Discovery Well Turns Into Big Oiler

The discovery well of new Washunga pool in Kay County, northern Oklahoma, originally completed as a gas well, is now producing 40 bbl. of oil hourly on ½-in. choke.

C. L. Carlock 1 Boxley, NE NE NE 36-27n-4e, completed recently for a flow of 25,000 M.c.f. per day from perforations in the Skinner sand at 2,992½-3,000 ft. Further work and fracturing converted the gas well into a high flowing oil well. On open choke it flowed load and flowed 60 bbl. of new oil per hour. Gravity is 44°.

The same operator has two more wells with high flow rates in the pool. The 2 Boxley,

NW SE NE 36-27n-4e, flowed 66 bbl. of new oil hourly after fracture from Skinner sand perforations at 2,998-3,008 ft. The 3 Boxley, NE SW NE 36-27n-4e, flowed 40 bbl. of oil hourly on ½-in. choke following fracture of perforations at 2,965-83 ft. in the Skinner.

Woodford Reached at Marshall County Test

Sinclair Oil & Gas Co. et al 1 Griffin, SE NE NE 16-5-5e, has hit the Woodford and is below 4,325 ft. The indicated Marshall County wildcat discovery indicated gas production on a test up the hole. It also showed for oil still further up. The gas flow was 2,830 M.c.f. per day at 4,067-4,120 ft. Recovery on a drill-stem test at 1,254-70 ft. was 165 ft. of muddy green oil.

TEXAS

WEST TEXAS

New Ellenburger Oil For Eastern Crockett

Exploration work in Crockett County has assured the area of another Ellenburger pool. Pan American Production Co. 1 West flowed oil on its initial drill-stem test in the Ellenburger and on second test flowed at the rate of 60 bbl. an hour. Location is about midway between Ellenburger production in Midway Lane and Childress fields, and 8 miles northeast of Pure Oil Co.'s Vaughn-Ellenburger discovery.

Operators reported sample top on the Ellenburger at 8,006 ft., minus datum point of 5,415 ft. On the initial test, at 8,006-34 ft., gas showed in 5 minutes and oil in 37 minutes. Flow was turned into pits for 2 minutes, with no estimate on amount. Flowing pressure was 1,850 psi.

Second drill-stem test, at 8,030-53 ft., had gas in 4 minutes and oil in 27. During the last 18 minutes of the test the well flowed at the 60-bbl. an hour rate. Recovery in the pipe included 30 ft. of oil and gas-cut water, but it had not been determined whether or not it was formation water. Flowing pressure ranged from 3,000-2,770 psi. and 15-minute shut-in pressure reached 3,295 psi.

Toyah Unit Test Will Make Dry-Gas Discovery

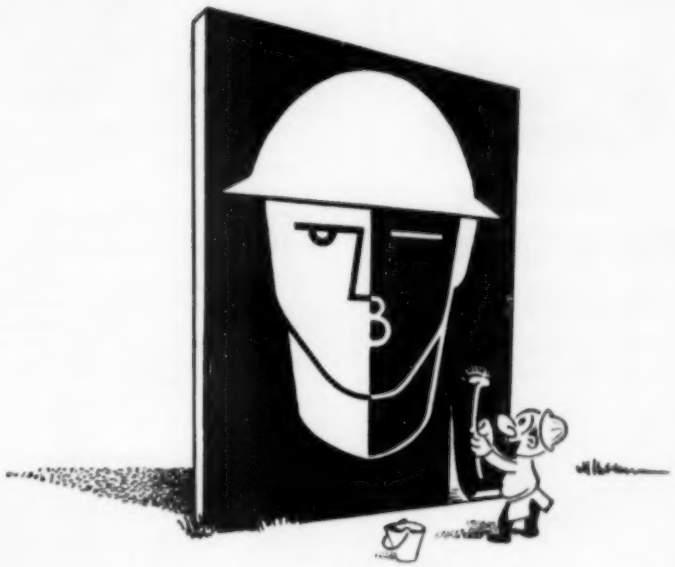
Gulf Oil Corp. and Phillips Petroleum Co. 1 Shurtleff (1 Toyah Unit), Ellenburger failure 7 miles east of Toyah in Reeves County, was expected to make a commercial gasser from the Devonian.

Total depth was 15,048 ft., plugged back to 12,825 ft. Top of the Devonian chert was placed at 12,553 ft. On production test at 12,570-12,610 and 12,690-12,795 ft. the well flowed at the rate of 15,800 M.f.g. per day. Gas was reported as dry. Choke size on the test was 33/64-in. and flowing pressure was 2,300 psi. Operators released the rig and will make completion tests.

TEXAS GULF COAST

Goliad County Discovery Produces Gas-Condensate

Kirkwood & Co.'s new gas-condensate discovery well north of Anders, in northeastern Goliad County, flowed at the rate of 35,000,000 cu. ft. of gas per day on open-flow potential tests, and now is shut-in under



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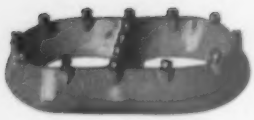

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pressure of 3,240 psi. Gas flow carried 53.2°-gravity condensate in the ratio of 40,000 cu. ft. of gas per barrel of liquid.

The well, 1 Phillip Fuchs estate, in Abel Sigmon Survey, is west of Meyersville field, across the line in DeWitt and Victoria counties.

Production is from the Wilcox Massive section with casing perforated at 8,768-88 ft. Hole was drilled to 9,120 ft.

Gas Production Spreads In Magnet-Withers Area

Productive area of Magnet-Withers field, in southern Wharton County, spread another half mile to the south with the completion by Smith & Smith, of Wharton, of their 1 Thompson, good for 20,500,000 cu. ft. of dry gas per day on open-flow potential gage. Completion is in sand interval at 4,235-45 ft., in hole bottomed at 4,512 ft. Shut-in pressure is 1,738 psi.

Operators are stepping farther to the southwest for their next well, 1-B Thompson, located in Block 5, John Crownover Survey. The first extension well is in Block 3, same survey.

Wadsworth Extends North

Magnolia Petroleum Co. has extended production at Wadsworth, in Matagorda County, more than a half mile to the northwest at its 8 Cornelius.

Completed in Frio sand at 10,282-89 ft., the well flowed at the rate of 370 bbl. of 49.5°-gravity oil per day through 18/64-in. choke. Gas-oil ratio measured 8,520 cu. ft. per barrel, and flowing pressure 2,780 psi.

NORTH TEXAS

Conglomerate Discoveries Completed in Montague

Operators in Montague County finished two Pennsylvanian discoveries last week. Arnold H. Bruner and Nortex Oil & Gas Co. 1 McCall-Fooshee, 3½ miles northwest of Montague, made a good flowing well from the second Bend conglomerate at 6,284-90 ft. Potential was 263 bbl. of oil a day through 28/64-in. choke, with tubing pressure at 275 psi. and gas-oil ratio of 675 cu. ft. Location is 1 mile north of the Minor conglomerate field.

Star Oil Co. 1 McCall, 4½ miles southwest of Nocona, in Block 179, J. Olibarri Survey, completed as a pumper for 120 bbl. of oil a day from the Caddo conglomerate at 6,250-58 ft. Top of the Caddo was 5,660 ft. and top of conglomerate was 6,250 ft.

Grayson County prospect . . . Shell Oil Co. 1 Brown, 2 miles south of Pottsboro, recovered 1,900 ft. of 34° oil on a 1-hour drill-stem test in sand at 7,668-88 ft. Location in the J. W. Vanderen Survey is 2½ miles north of production from the same zone in Sherman field. Drilling continued below 8,040 ft., on an 8,500 ft. contract.

L. O. McMillan 1 Harry Reast, 5 miles north of Whitesboro, recovered 6,900 ft. of oil on a 2-hour drill-stem test in Oil Creek sand at 7,385-92 ft., and was watiing on orders. This well has also shown for good production from the Pennsylvanian.

SOUTHWEST TEXAS

New Vicksburg Pay Opened

A new Vicksburg oil reservoir has been opened in Captain Lucy field, in Jim Wells County. New-pay discovery is by Lyman-Damuscus Operations at 1-B Erck, completed with a potential rating of 82.8 bbl. of 41.1°-gravity oil per day through 7/64-in. choke. Pay interval is at 5,977-80 ft. Gas-oil ratio is 455 cu. ft. per barrel, and flowing pressure 400 psi. on tubing. Total depth is 6,368 ft.

New Aguilares Producer Proves Fourth Pay Zone

Skelly Oil Co. has an indicated new-pay discovery in its Aguilares Wilcox field, in Webb County. Its 1-C Martin, testing Wilcox sand at 6,463-80 ft., flowed 6.7 bbl. fluid, 75 per cent oil, per hour through 5/42-in. choke. Gas-fluid ratio was 1,580 cu. ft. per barrel with tubing pressure of 1,280 psi.

This is Skelly's fourth well in the field. Two were completed as gas-condensate pro-

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ducers in Wilcox sands at 6,125-50 ft., and 6,250-90 ft. The third was an oil producer in sand at 6,724-29 ft.

KANSAS

New Gas Pool Opened In Southern Barber

A new gas pool is reported in southern Barber County, south Kansas. The strike is Aurora Gasoline Co.-Barbour Drilling Co. 1 Rathgeber, a tight hole 2 miles north of Hardtner.

Reports state that the well flowed an estimated 8,000 M.c.f. of gas per day on drill-stem test unofficially. The wildcat is located in the C NE SE 31-34s-12w, 7½ miles south of Boggs pool.

Three miles northwest of Rhodes pool Barbara Oil Co. and R. C. Patton 1 McClure is shut-in for connection in SW SW SW 6-33s-11w. This gas strike reported open flow of 3,020 M.c.f. per day from perforations in the Elgin at 3,548-71 ft.

The Douglas sand brought 3,780 M.c.f. of gas per day on drill-stem test at 3,746-58 ft. at Orville Parker 1 Chain, SE SE SE 21-31s-11w, 1½ miles east of Whelan pool in the northeast part of Barber County.

Lansing Discovery Reports Swab Gage in Ellis

Veeder Supply and North American Car Corp. 1 Irwin, 3 miles east of Mendota pool, northwestern Ellis County, is going on the pump after swabbing got 21 bbl. of oil per hour for 8 hours on test of Lansing perforations at 3,368-74 ft.

The wildcat is in NW NW NW 11-11s-20w.

Pawnee Cherokee Strike Going on the Pump

Pawnee County has a new Cherokee sand discovery at National Cooperative Refinery Association 1 Ekert, NW NW NW 18-20s-19w.

The wildcat swabbed 10 bbl. of oil hourly with no water. Perforations were at 4,223-25 ft. The discovery is 1 mile east of Shiley pool.

MISSISSIPPI

Second Wilcox Discovery In Two Weeks Indicated

Mississippi's second Wilcox discovery well within 2 weeks and the eighth for the year is being completed by Serio-Punches Oil Co. and Como Drilling Co. in northwestern Wilkinson County.

The new discovery, 1 Pettis, in 25-4n-3w, flowed at the rate of 120 bbl. of oil per day through ⅛-in. choke with pressure of 650 psi. during initial tests. It has 7 ft. of pay in a perforated interval at 6,378½-81½ ft.

Its testing follows the completion the preceding week by Serio-Punches Oil Co., sole operator, of a Wilcox producer 3 miles east of LaGrange field, approximately 25 miles to the northeast in Adams County.

The latter well, pumping 115 bbl. of 39°-gravity oil per day from pay-interval at 6,292-97 ft., has been designated as the discovery of Popular Grove field.

NEW MEXICO

SOUTHEAST NEW MEXICO

Bone Springs Discovery Is Completed

Superior Oil Co. 1-23 McAlpin, 23-18s-35e, Lea County, has been completed as a Bone Springs discovery, flowing 182 bbl. of oil a day through 24/64-in. choke. Location is 4 miles southeast of San Andres production in Vacuum field.

The well was drilled to 12,355 ft. then plugged back to 10,050 ft. Pay perforations were at 9,980-93 ft. Gas-oil ratio was 760 cu. ft. and gravity was 42°. The Bone Springs is middle-Permian in age and a member of the Delaware Mountain group.

Deep exploration staked . . . Olsen Oils, Inc., Oklahoma City, has announced plans for a 12,500-ft. wildcat on a farmout from Sinclair Oil & Gas Co. The projected test will be in NE NE 13-26s-35e, which is on the eastern rim of the Delaware basin, and 8 miles southwest of Jal.

Olsen Oils was reported to have acquired a half interest in the Sand Hills Unit, covering a block of over 20,000 acres. Other companies interested in the unit are Sun Oil Co., Magnolia Petroleum Co., Phillips Petroleum Co., Southern Petroleum Exploration Co., General Crude Oil Co. and Foster Petroleum Co.

Rework job is discovery . . . In Eddy County a workover job at an old dry hole has resulted in flush oil from the Yates sand. Simms & Reese 1 McClay, 33-18s-30e, responded to a heavy fracture test at 2,843-76

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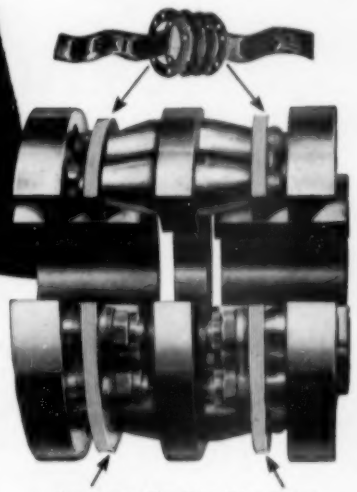

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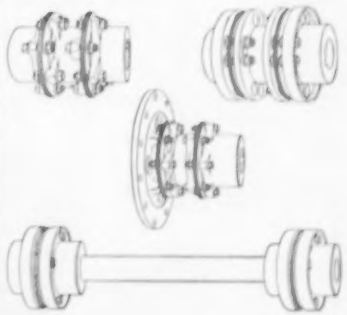

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ft. and was reported to have flowed an estimated 500 bbl. of oil a day, by heads, through ¾-in. choke.

The well was originally drilled by Dooley & Shank as 1 Patton and abandoned at 3,556 ft. Nearest production is Benson (Seven Rivers) field, 2 miles to the south.

MICHIGAN

A permanent proration order, limiting oil and wet gas production from Northville pool Trenton and Black River oil wells became effective by order signed by Supervisor of Wells Gerald E. Eddy on September 20, following a public hearing by the Supervisor and Advisory Board in Lansing on September 17.

The continuing order contained the same provisions on oil and gas production as was first established by the 21-day emergency regulation ordered by the supervisor on August 30. The emergency order was issued . . . "because of possible present physical waste and the imminent danger of further physical waste. . . ." The proration order (like the emergency regulation) allows that 10-acre unit Trenton and Black River formation wells may produce a daily allowable not to exceed 200 barrels of oil nor more than 1,000 cu. ft. of gas per barrel of oil in any 24-hour day. No special control was placed on the Niagaran formation which is a known gas producing horizon in the pool.

For the purpose of the regulation, Northville pool was defined to include: Sections 1, 2, E½ 3, Sections 11, 12 and 13-1s-7e, Salem Township, Washtenaw County; Sections 6, 7, 8, SW 9, Sections 16, 17 and 18-1s-8e, Northville Township, Wayne County; the E½ Section 34, Sections 35 and 36-1n-7e, Lyon Township, Oakland County; and Section 31-1n-8e, Novi Township, Oakland County.

A spacing order was issued after this public hearing for one other Washtenaw County Trenton-Black River formation pool—the recently Sun-discovered Freedom Township pool. In this field, only one well to each regular 40-acre unit may be drilled. The drilling unit for oil wells in the pool will be a regular governmental surveyed quarter-quarter section of land with the well to be located in the center of the southwest one-quarter of the drilling unit. This order likewise became effective on September 20.

The Freedom Trenton-Black River formation oil pool, for the purpose of this order was defined to be: Section 36-2s-3e, Sylvan Township; Section 31-2s-4e, Lima Township; Section 1-3s-3e, Sharon Township; Sections 4, 5, 6, 7, 8, 9, 16, 17, 18-3s-4e, Freedom Township, all in Washtenaw County.

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ROCKY MOUNTAIN

MONTANA

Fallon County Wildcat Promises New Field

Monoco Oil Co. is reported still testing at 1 Ferguson-Goldin, C N½ SE SW 18-7n-61e, Fallon County. The wildcat has been rumored to be an Ordovician discovery for some time, with no data available. The operator is still withholding data.

The well was tested in the interval 9,235-49 ft. and recovery was 8,990 ft. of clean, very gassy oil under flowing pressure of 400-2,600 psi. Gas flowed after 50 minutes of the test, which was of undisclosed duration.

Total depth, tops and other details have not become available generally in the region. The well has aroused considerable interest because of its location east of the Cedar Creek anticline and the fact that production is apparently from a stratigraphic trap, in Ordovician.

There has been no other deep drilling in the immediate vicinity. Plans for further operations in the area have not been announced by Monoco or by other operators with interests in the area.

Leasing interest has been reported high, with substantial per acre prices paid for leases in this area of the state, and sizable overrides reserved.

Shell Completing Discovery North of Little Beaver

Shell Oil Co. is reported completing 14-34 Unit, C SW SW 34-5n-61e, 2½ miles north of Little Beaver field as an Ordovician producer. The well made 288 bbl. of fluid per day on swab test of open hole at 8,202-8,319 ft. Of this recovery 245 bbl. was oil.

This well is on the Cedar Creek anticline and within a Montana-Dakota Utilities Co. producing gas unit.

Potential At Wibaux Discovery Released

Lion Oil Co. has reported a pump gage of 118 bbl. of oil per day at 1 Knight, C SW NW 29-14n-50e in the Wibaux area of Wibaux County. The well was completed several weeks ago, but production details have been withheld. The wildcat was completed in Ordovician at 11,024-11,044 and 11,099-11,119

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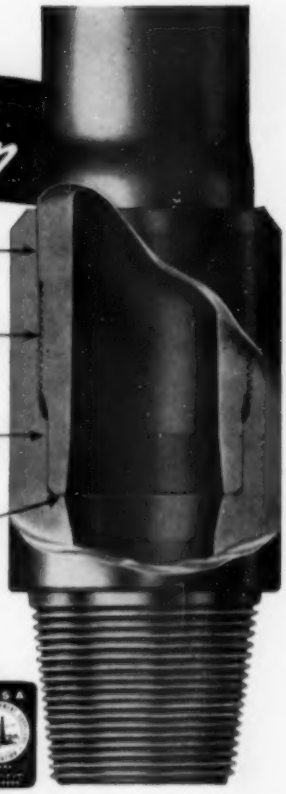

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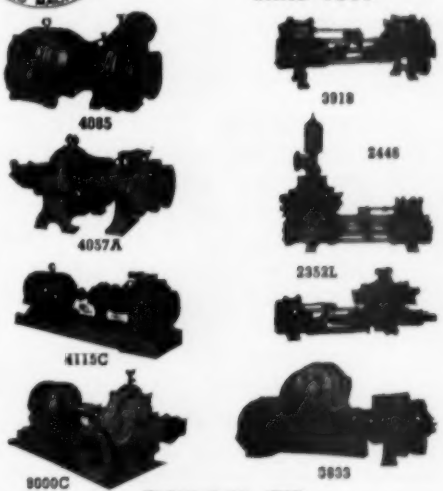

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ft. Both zones were acidized. Total depth is 11,153 ft.

The well is east of the Cedar Creek anticline where several wells over a rather large area have reported good shows, but have failed of commercial completion.

Lion holds a 7,000-acre block on which the discovery was drilled, and has other considerable acreage holdings in the area, but has announced no further plans.

Hailstone Dome Gas Discovery Completed

Northern Natural Gas Producing Co. tested gas at the rate of 5,500 M.c.f. per day at completion of 2-A NP C NW SE 31-5n-20e, in the Big Coulee-Hailstone Dome area of Golden Valley County. The well found production in Morrison at 1,952-69 and 1,981-88 ft. A second well is drilling 1½ miles northeast of the discovery at 1-B NP, C SE NW 29-5n-60e.

NORTH DAKOTA

Stark County Producer Completed

Amerada Petroleum Corp. recovered 107 bbl. of oil with 24 per cent water on 10½-hour swab test of 1 Newton, NW SW 31-140n-99w, Stark County. The well is about 4 miles northeast of Fryburg field, and just across the Billings County-Stark County line. Total depth is 9,577 ft. and production is from Heath, through perforations at 8,249-54 ft. The operator tested Madison, but had only small shows. The Heath (?) is productive in one well in Frybur field and had shows in practically all the drilling done in that field.

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CALIFORNIA

Shallow Cuyama Oil Find Recorded by Richfield

Richfield Oil Corp.'s continued search for new pools in Cuyama Valley was rewarded by a shallow sand discovery in the South Cuyama field. Its 112-6 Hibberd, in the south central part of the field, topped the Santa Margarita at 2,056 ft. and was completed flowing 100 bbl. of 26°-gravity crude from the interval 2,046-2,221 ft.

Location of the 2,222-ft. test is in NW NW 6-9n-26w, in an area where the field's regular Dibblee and Hibberd sands are irregularly developed. Extent of the shallower pay therefore is not expected to be extensive. The 100-bbl. initial flow was through a 14/64-in. choke and was accompanied by 20 M.c.f. of gas.

Third Airport Well Completed

The Texas Co. completed its third producer in the deep Miocene pool it discovered on its Long Beach Airport lease east of the older Signal Hill area. The new well, 2 Airport-2, was bottomed at 9,175 ft. where it was completed flowing 462 bbl. of 30°-gravity crude, cut 20 per cent, through a 17/64-in. choke. Faulting is believed to separate this development from the main part of the field.

CANADA

Success Reported at Hespero Area Extension

The team of Hudson's Bay Oil & Gas Co., Ltd., Amurex Oil Development Co. and Richfield Oil Corp. of California, at their extension venture in the Hespero area of Alberta, have discovered sizable flows of gas along with some distillate.

The discovery came in the D3 zone of Devonian, which was topped at 8,882 ft., or 5,775 ft., subsea (K.B. elevation 3,107 ft.). So far, 31 ft. of water-free pay have been encountered.

The new gas strike was made at Hudson's Bay-Amurex-Richfield 16-32 Medin, LSD 16, 32-38-3w5, ¾ mile northeast of the team's 1-2 Medin dual zone oil discovery. The 16-32 Medin well had been assured of both Mississippian and D2 oil production prior to entering the D3.

First test in the discovery horizon, 1 hour in duration, was run of interval 8,880-8,893 ft. The 800 ft. water cushion rose to the surface in 6 minutes, and natural gas flowed to the surface at rate estimated in excess of 10,000,000 cu. ft. daily. Recovery consisted of 180 ft. of dark green to black condensate.

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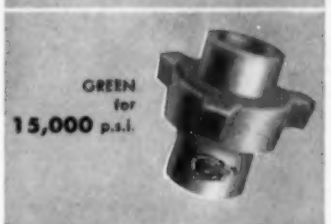

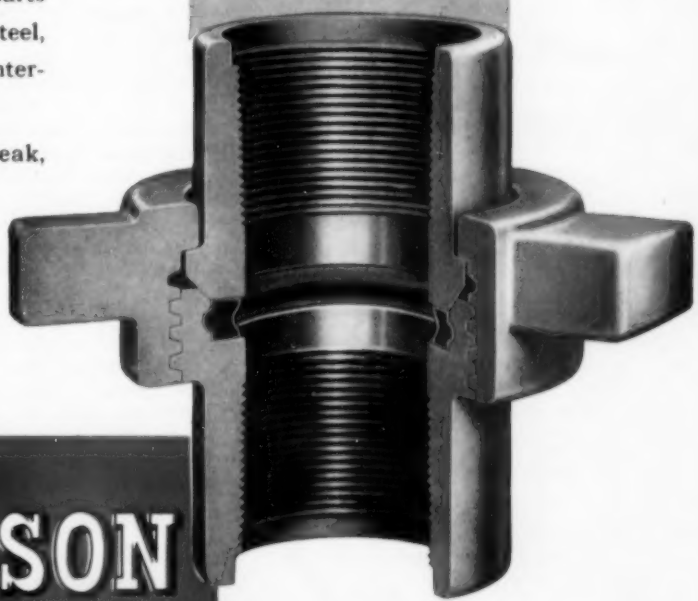

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Next test, of interval 8,893-8,903 ft., for 135 minutes, showed a fair blow increasing to good in 1½ minutes. Natural gas flowed in 9 minutes, at average rate of 850,000 cu. ft. daily during the first hour and 2,000,000 cu. ft. daily during the second hour. When pipe was pulled it was found to contain 180 ft. of distillate, 270 ft. of gassy water cushion and 135 ft. of highly gassified mud.

The last reported test, run from 8,903-13 ft. for 1 hour, using an 800-ft. water cushion, showed a weak initial puff, with gas in 3 minutes, and water cushion to surface in 5 minutes, heading in 12 minutes for ½ hour. Gas and distillate flowed in 30 minutes, with maximum gas rate being 8,700,000 cu. ft. daily. Pipe recovery amounted to 210 ft. of distillate, 270 ft. of highly gas-cut and slightly oil-cut mud. Crew was preparing to core and then run a further test.

Hopedale . . . Natural gas has been discovered in indicated commercial volume at the Canso Oil Producers, Ltd., exploratory venture in the Hopedale area of southwestern Saskatchewan according to unofficial but reliable sources. The well is currently awaiting service rig to complete after finding natural gas in rates ranging from 1,200,000 to 1,600,000 cu. ft. daily during drill-stem tests in the Viking sand discovery formation.

The well, Canso-New Superior et al 6-30 Hopedale, LSD 6, 30-31-22w3, situated 2¼ miles southeast of Imperial Oil, Ltd.'s Viking oil discovery well at Eureka and 4 miles east of heavy crude oil production in the Coleville area, is being drilled by Canso Oil on farmout from the New Superior-General Petroleums group.

Grassy Island Lake . . . The California Standard Co. has discovered a sizable flow of natural gas from the Viking sand at its current exploratory driller in the Grassy Island Lake district of southeastern Alberta, about 55 miles east of Hanna.

Island Lake, which is 4 miles east-northeast of the company's No. 2 abandonment, 2¾ miles west of the McColl-Frontenac 4-5 abandonment and 6½ miles west-southwest of Cal Standard's No. 1 abandonment.

After entering the Viking a 1-hour drill-stem test was run from 2,777 to 2,820 ft. and

This new gasser is Cal-Standard 3 Grassy natural gas reached the surface in 2 minutes, flowing at maximum rate 3,610,000 cu. ft. daily. Hole was taken down to 2,835 ft., and crew is now running string of production casing.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Atascosa County: Harrell & Southworth 1 Southworth 1 Munoz, Henry H. Wood Sur. 1508, A-923. IPP 10 BOPD (plus 10 per cent water), 42°, Navarro 4,030-48 ft. and 4,050-58 ft. (perforations). TD 4,109 ft. (New field.)

Frio County: Alaska Steamship Co. and C. G. Dunwoody, Jr. 1 Shiner, J. A. Detoyster Sur. 6, A-1350. Dry. TD 5,485 ft.

Howeth & Mason 2 Berry, BS&F Sur. 637, A-152. Dry. TD 4,160 ft.

LaSalle County: B. G. Byars and C. G. Dunwoody, Jr. 1 Barkley, G. W. Winslow Sur. 16½, A-1145. Dry. TD 5,398 ft.

McMullen County: M. L. Wise et al 1 Hagist Ranch, J. E. Murphy Sur. 481, A-1180. Dry. TD 8,012 ft.

District 4

Cameron County: Holmes Drilling Co. 1 Sweeney et al, Block 49, Fresnos Land

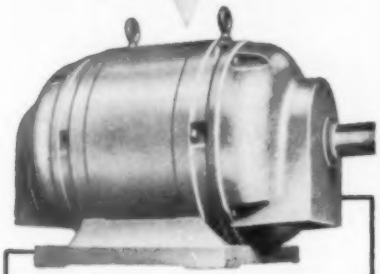
5 REASONS WHY

LEASE after LEASE PUMPS with

FIELDMASTER

BALL BEARING

MOTORS



In the field you can depend on FIELDMASTER Ball Bearing Motors because they're specially built to meet the exacting demands of oil country use. Below are just five of the many outstanding advantages that make FIELDMASTER Ball Bearing Motors unsurpassed in their field!

1. Vermin Proof!

No matter how small, rodents and other animals can't get inside a FIELDMASTER Motor.

2. Drip Proof!

Special splash proof construction prevents damage to the motor from liquids and flying particles.

3. Moisture Proof!

Motor windings are specially treated for outdoor service . . . conduit box is moisture proof and dust tight.

4. Corrosion Resistant!

Weather-protected FIELDMASTER Motors can be used in any kind of weather — rain, snow, sleet, blowing sand and dust.

5. Forced Air Cooled!

This exclusive fan-cooling system provides cooler operation over longer periods of time.

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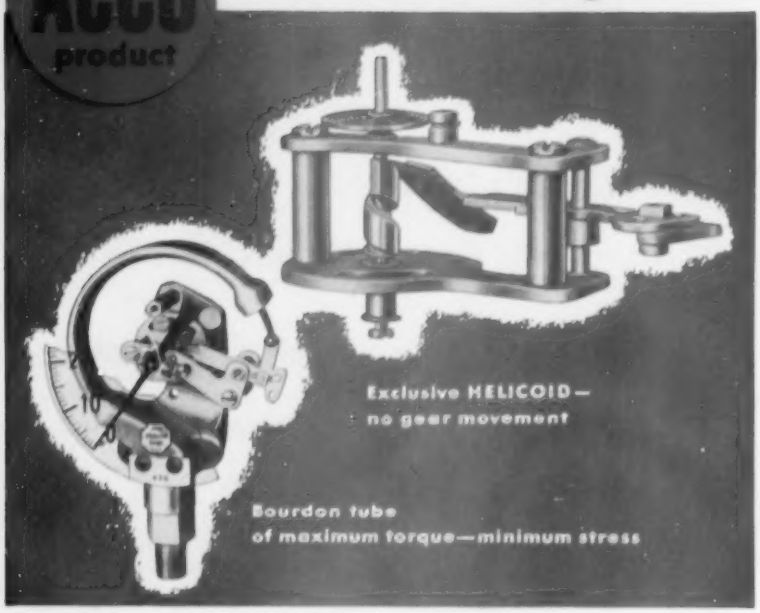

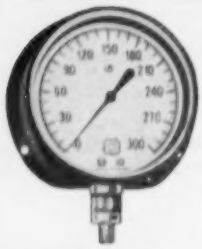

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WILDCAT COMPLETIONS

& Irrigation Co., Subd., Espiritu Santo Grant. Dry. TD 11,019 ft.

Duval County: Jake L. Hamon 1-B Morris, BS&F Sur. 65, A-91. Dry. TD 2,515 ft.

Hidalgo County: Kirkwood & Co. 1 Chandler, Lot 18, Valley Farms Subd. Dry. TD 8,216 ft.

San Patricio County: Frio Production Co. et al 1 McKamey et al, Tract 4, Block E, Gregory Farm. Dry. TD 6,117 ft.

Webb County: Magnolia Petroleum Co. 2 DCRC, Section 100-B, Duval County School Lands Lge. Dry. TD 2,556 ft.

Zapata County: T. R. Cunningham 1 Uribe, Survey 240. Dry. TD 3,636 ft.

TEXAS GULF COAST

District 2

Goliad County: Del Mar Drilling Co. 1 Corgey, Maria de Jesus de Bravo Sur., A-51. Dry. TD 7,665 ft.

Kirkwood & Co. 1 Phillip Fuchs estate, Abel Sigmon Sur., A-251. IP 35,000 M.c.f. daily, open-flow potential, GCR 40 M.c.f. per barrel, 53.2°, Wilcox Massive 8,768-88 ft. (perforations). TD 9,120 ft. (New field.)

Jackson County: Coastal Trend Oil & Gas Corp. 1 LaBauve, Sec. 37, R. Clement Subd., F. F. Wells Sur., A-78. Dry. TD 7,565 ft.

Lavaca County: Union Producing Co. 1-C Borchers, R. Williams Sur., A-512. IP 1,810 M.c.f. daily, open-flow potential, GCR 42,200 cu. ft. per barrel, 58°, perforations 8,525-27 ft. TD 14,428 ft. (New field.)

Live Oak County: C. G. Glasscock 1 Broeter, AB&M Sur. 45, A-63. Dry. TD 4,483 ft.

Herring & Grimes Oil & Gas Co. 1 Woodman et al, Block 68, Simmons Subd., J. Poitevent Sur., A-366 (East Maxine area). Dry. TD 7,516 ft.

Victoria County: Carrl Oil Co. 1 Diebel, Cecilia de la Garza Sur., A-169. Dry. TD 4,307 ft.

Kilroy Co. of Texas 2 McCan, Hannibal Bonny Sur., A-138. Dry. TD 6,487 ft.

Kilroy Co. of Texas 1 Williams, Winn Traylor Sur., A-335. Dry. TD 8,014 ft.

District 3

Chambers County: Clegg & Hunt et al 1 White, S. A. Spencer Sur. 76, A-550. Dry. TD 9,021 ft.

Fayette County: Bankline Oil Co. 1 Saigh, W. Williams Sur., A-109. Dry. TD 2,730 ft.

Hardin County: American Republics Corp. and Houston Oil Co. of Texas 5 Elliott Fee, F. P. Elliott Sur., A-18. IP 8,450 M.c.f. daily, open-flow potential, GCR 17,262 cu. ft. per barrel, 59.5°, Yegua ("Z" sand) 7,939-43 ft. (perforations). TD 7,996 ft. (New pay in West Silsbee field.)

American Republics Corp. and Houston Oil Co. of Texas 2 Raffert Fee, James Rafferty Sur., A-45. IP 14,900 M.c.f. daily, open-flow potential, GCR 31,973 cu. ft. per barrel, 64.6°, Yegua 6,614-18 ft. TD 7,626 ft. (New pay in North Silsbee field.)

General Crude Oil Co. and E. Cockrell, Jr., 1 Liter, Block 5, W. Young Sur., A-60. Dry. TD 10,658 ft.

Harris County: General Crude Oil Co. 1 John Danek, Sr., Meredith Duncan Sur., A-17 (west flank Esperson dome). Dry. TD 10,105 ft.

Star Oil & Gas Co. 1 Bender estate, Wherry B. Adams Sur., A-95. IP 9,750 M.c.f.

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- corrosion

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How a Sherman Power Digger Does More Work in Less Time with No Standby Equipment

Nearly every department in the city of Hopkins, Minnesota, finds a use for this versatile Sherman Power Digger.

The Water Department uses the machine when cutting off discontinued service lines at the main. They dig a hole in the street (usually blacktop) 3′ wide by 6′ long by 8′ deep. The hole must be plumbwalled for minimum replacement of paving. This operation used to tie up a truck all day, an air compressor half a day, and two men with hand tools, a full day.

Using a Sherman Power Digger, they now do *three* such jobs in one day, with only one man on the digger, no truck, and no compressor, except for concrete pavement. The job goes faster because they can dig the hole, shut off the line, and backfill before the walls begin to cave. Local soil conditions formerly required cribbing many of these excavations.

If *your* work involves the construction or maintenance of underground facilities, you will profit with a Sherman Power Digger. It's compact, fast, and flexible, with low initial cost and amazing economy of operation. Write today for full details, without obligation. Ask for Bulletin No. A16.

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Flat mating surfaces within .000005", or less, of every set of Okadee valve discs and seats mean absolute shut-off of any material from ammonia gas to asphalt.

How long does this seal last in service? We honestly don't know. Tests under working conditions with propane were stopped after 269,000 operating cycles when no wear or seal failure could be detected. And Okadee valves do not have to be babied in service on corrosive or abrasive materials . . . Thousands of boilers have had Okadee blow-down valves in continuous, trouble-free service for fifteen years or more. If Okadee size-pressure-temperature ranges include your valve applications, Okadee installation will end your problems of valve performance once and for all.

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WILDCAT COMPLETIONS

daily, open-flow potential. Dry. Frio 2,741-44 ft. (perforations). TD 3,510 ft. (New pay in Humble field.)

Liberty County: Dan J. Harrison, Jr., 9-A Harrison Fee, H&TC Sur. 3, A-227. IP 147.12 BOPD, 10/64-in., 24.5°, perforations 3,626-32 ft. TD 4,103 ft. (New pay in Hankamer field.)

Matagorda County: Kilroy Co. of Texas 1 White, I&GN Sur. 16, A-280. IP 179.24 BOPD, 10/64-in., 28.5°, Frio 7,685-88 ft. (perforations). TD 8,600 ft. (New pay in Arch field.)

Orange County: American Republics Corp. and Houston Oil Co. of Texas 3-A Lutcher-Moore, James Dyson Sur., A-8. Dry. TD 10,118 ft.

Wharton County: Colorado Oil & Gas Corp. and Acco Oil & Gas Co. 1 Meek, W. F. Dobbins Sur., A-88. IP 4,200 M.c.f. daily, open-flow potential, dry. Miocene 2,912-19 ft. (perforations), and 3,800 M.c.f. daily, open-flow potential, dry. Miocene 4,270-76 ft. (perforation), dry TD 5,305 ft. (Extends North Louise field.)

Colorado Oil & Gas Corp. and Acco Oil & Gas Co. 1 Beck-Rasmussen, E. C. King. Sur. 36, A-607 (North Louise area). Dry. TD 5,205 ft.

EAST TEXAS

Cass County: F. R. Jackson 1 White & Walker Lumber Co., J. J. Potter Sur., A-860. Dry. TD 6,740 ft.

Cherokee County: Sam Bright 1 Lindstrom, Sara Ann Duncan Sur., A-14. Dry. TD 5,845 ft.

F. R. Jackson 1 Sherman, W. W. Baker Sur., A-98. Dry. TD 4,818 ft.

Freestone County: W. E. Allaun 1 Stubbs, J. T. Love Sur. Dry. TD 1,177 ft.

Stroube & Stroube 1 Edens, J. Roque Sur., A-525. Dry. TD 4,013 ft.

Henderson County: Purnell & Coleman 1 Carpenter, W. M. Ligon Sur., A-430. Dry. TD 7,915 ft.

Limestone County: Caroline Hunt Trust 2 Ward, Pedro Varela Sur., A-30. Dry. TD 1,500 ft.

Marion County: O. C. Billingsley 1 Ford, A. Abrams Sur., A-74. Dry. TD 3,565 ft. Elev. 201 ft., Woodbine 3,458 ft.

Nacogdoches County: Watburn Oil Co. 1 Mast, J. P. Gorman Sur., A-235. Dry. TD 5,158 ft.

Van Zandt County: Stroube & Stroube 1 Brown, C. E. Klein Sur., A-460. Dry. TD 6,012 ft.

TEXAS PANHANDLE

Hansford County: Toklan Producing Co. 1 Collard, 45-75, H&TC. Dry. TD 7,710 ft.

Fulton 1 Jackson, SE SW NE 45-114, H&TC. IP 15,532 M.c.f. of gas per day, flowed 13 BDPD per million, Atoka 6,904-27; 6,952-78 ft., 75.3°. TD 7,108 ft. (gas-condensate discovery.)

Hemphill County: Falcon Seaboard Drilling Co. 1 Hogsdon, 42-20, H&TC. Dry. TD 7,350 ft.

WEST CENTRAL TEXAS

Callahan County: R. Mankin 1 Calhoun, Blk. 60, Comal CSL Sur. 181. Dry. TD 1,790 ft.

Coleman County: A. B. See Drilling Co. 1 Thompson, Burnett CSL Sur. 57. Dry. TD 3,267 ft. Elev. 1,941 ft., Gray 3,210 ft.

Jones County: W. F. Newton 1 Bartlett, Blk. 7, C. Allen Sur. 10. Dry. TD 2,275 ft.

NORTH TEXAS

Archer County: Bolin Oil Co. et al 1 Cowan-

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

What to do when a hose blows at night

B. F. Goodrich offers new emergency service to oil drilling industry

NOW B. F. Goodrich has 12 oil field warehouses stocked with all sizes and types of hose and V belts. So when a hose blows at night or V belts break on Sunday, you can get replacements without waiting at the warehouse nearest you.

All you do is call the B. F. Goodrich warehouse number listed in the phone book in these cities. After 6:00 P. M., you can reach the warehouse manager at home. Night numbers are in the phone books.

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This warehouse system permits fastet service from your supply store, too. There's no need to wait for factory shipments on rubber products when your local supplier can fill your order on a pick-up basis from the conveniently located B. F. Goodrich stocking points.

When emergencies make *service* the first consideration in buying hose and V belts, it will pay you to take advantage of the fast service you get at the 12 B. F. Goodrich warehouses. And, remember, along with convenience, B. F. Goodrich gives you many exclusive product features designed to *prevent* emergencies. It stands to reason that improved rubber products like Grommet V belts which outlast other types by 2 and even 3 times will make important savings in replacement costs as well as uninterrupted drilling time.

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WILDCAT COMPLETIONS

McKinney, Blk. 85, Jefferson CSL. Dry. TD 1,090 ft.
I. B. Perskey 2-A Matlock, Blk. 26, J. Saunders Sur. Dry. TD 700 ft.

Baylor County: Ada Oil Co. 1 Prikyrl, Sec. 175, T&NO Sur. Dry. TD 5,125 ft.

Clay County: L. T. Burns 1 Veitenheimer, Blk. 2, Clark & Plumb Subd. Dry. TD 5,598 ft.
McMahon-Bullington Drilling Co. 1 Reeder, Blk. 104, Wood CSL. Dry. TD 4,444 ft.

Grayson County: Thos. D. Humphrey & Sons 1 Francis, W. P. Johnson Sur., A-628. Dry. TD 6,009 ft.

Jack County: Bolin Oil Co. 1 Graham-Loving, W. M. Biffle Sur., A-2142. Dry. TD 5,612 ft. Elev. 1,258 ft., Ellenburger 5,598-5,612 ft.
Warren Petroleum Corp. 3 Lupton-Brown, W. Williams Sur., A-876. Dry. TD 5,440 ft.
Warren Petroleum 1 Riddle, J. H. Rhodes Sur., A-1711. Dry. TD 3,508 ft.

Montague County: P. C. Bundy 1 Arveson, Blk. 185, J. Smith Sur. Dry. TD 6,358 ft.

Wichita County: C. E. Morrison 1 Krohn, 17-A144-H&GN. Dry. TD 4,183 ft.

Wise County: Sherrod & Apperson 1 Lowrie, C. W. Egery Sur., 4 mi. NW Chico. IP 98 BOPD, 23/64-in., 44°, TP 80 psi., GOR 700 cu. ft., pay Atoka conglomerate 5,552-73 ft. TD 5,575 ft.

Young County: Childress Drilling Co. 1 Carter, W. S. Kelly Sur., A-2258. Dry. TD 4,851 ft.
Drill Well Oil Co. 1 Stephens, Blk. 14, TE&L Sur. Dry. TD 3,651 ft.
Neeld & Hood Drilling Co. 1 Self, A. Rohus Sur., A-240. Dry. TD 3,726 ft.
Terry & O'Brien 1 Greer, Blk. 76, TE&L Sur., A-352. Dry. TD 1,100 ft.
Woodson Oil Co. 1-B Allison, TE&L Sur. 627. Dry. TD 5,379 ft.

WEST TEXAS

Andrews County: Richardson & Bass 1 McWhorter, 13-A38-PSL. Dry. TD 11,466 ft. Elev. 3,460 ft., Devonian 8,666 ft., Ellenburger 11,230 ft., pre-Cambrian 11,466 ft.

Borden County: Hanley Co. 1 Russell, 7-27-H&TC. Dry. TD 7,810 ft. Elev. 2,413 ft., reef 7,448 ft.
Phillips Petroleum Co. 1 Quartz, 15-33-T4N-T&P, 14 miles SW Gail. IP 864 BOPD, 32/64-in., 35°, GOR 652 cu. ft., TP 300 psi., Spraberry pay 6,303 ft. TD 8,555 ft.

Crockett County: Ada Oil Co. 1 Kincaid estate, 2-KL-GC&SF. Dry. TD 8,710 ft.
Humble Oil & Refining Co. 1-B Shannon, 58-UV-GC&SF, 21 miles NW Ozona, NW extension to 1-H Shannon discovery. IP 205 BOPD, 20/64-in., 36°, GOR 719 cu. ft., TP 160 psi., pay 7,118 ft. TD 7,485 ft.

Garza County: Earle M. Craig, Jr. 1 Sims, 875-97-H&TC. Dry. TD 2,915 ft.
Lenonie Oil Co. 2 Crisp, Sec. 1298, Certificate 57, GD&W Sur. Dry. TD 4,383 ft.

Hockley County: Stanolind Oil & Gas Co. 3 Slaughter, Labor 60, League 36, Zavalla CSL. Dry. TD 9,500 ft. Elev. 3,491 ft., Wolfcamp 8,390 ft.

Irion County: Amerada Petroleum Corp. 1 Van Keuren, 24-1-H&TC. Dry. TD 8,171 ft.

Kent County: Chapman & McFarlin Production Co. 85 Cogdell, 47-4-H&GN, 22 miles NE Snyder. IPP 5.72 BOPD, 38°, San Andres pay 1,518 ft. TD 7,211 ft.

Martin County: Durham Drilling Co. 1 Flynt, 25-319-Garza CSL. Dry. TD 4,909 ft.

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For a GOOD
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B and W Scratchers

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*The highest percentage of successful cement jobs result from . . . mud removal and prevention of channelling by . . . movement of the casing, from the time casing reaches bottom until the plug "bumps."

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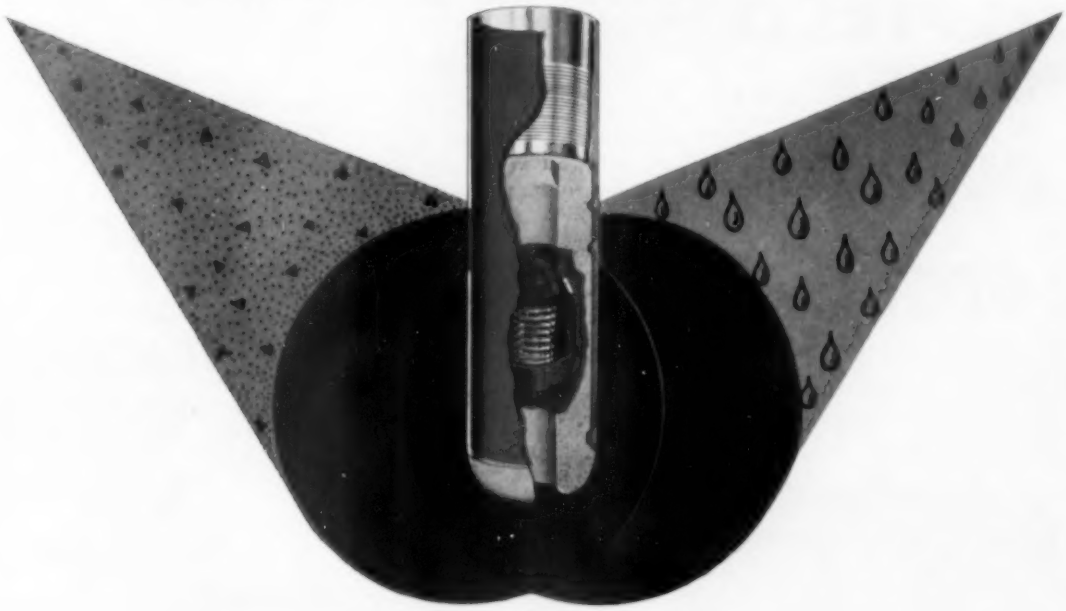

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Only the most advanced floating equipment can give efficient service under today's toughest conditions. And that's exactly what you get with Halliburton's new Super Seal Floating Equipment—the most advanced equipment designed for enduring, efficient operation and a fluid-tight seal under the rugged conditions that cause ordinary valves to fail.

And because Super Seal has been proved in complete tests and extensive field use to give this super service under the toughest conditions, you can have confidence in its dependable operation under *any* conditions.

The new Super Seal Valve, now used in the re-designed Halliburton Floating Equipment, has a unique conical valve design that eliminates the major weakness of older valves. The new valve has been proved able to take higher pressures and heavier wear without loss of efficiency. Under the toughest tests, which involved hours of continuous abuse by viscous slurries and pressures up to 15,000 p.s.i., there was no damaging wear, no leakage, no fouling and a perfect leakproof shut-off every time!

This is the super service that is making it possible to successfully cement under once-impossible conditions. And this consistently safer service makes it possible for you to order with confidence *the best floating equipment from the world's most experienced cementers.* Just specify the new Super Seal Floating Equipment from Halliburton, who alone has had two-million-job experience and thirty years of research. Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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It's built *big* to perform bigger jobs. It's built with the heavy-duty construction and moderate-speed design typical of all MM Oilfield Engines . . . with the kind of durability that takes cycle peak loadings in stride.

That's the Minneapolis-Moline 800-6A . . . the new six cylinder engine offering 5⅛-inch bore, 6-inch stroke, and 800 cubic inch piston displacement. With this 800-6A, lower piston speeds for less wear result in longer engine life, less down time and fewer service costs. All of the MM continuous-duty advantages which have proved so outstanding in oil industry operations work for you.

Large oil filters submerged in water-jacketed base pan supply cleaner oil to cylinders and bearings at constant temperature, regardless of load or weather conditions. Controlled temperature provides most complete filtering and elimination of sludge. Shafts, bearings, cylinder block, crankcase, base pan, flywheel, clutch and power shafts are engineered for big capacity to make the 800-6A the sturdiest engine in its size and price class.

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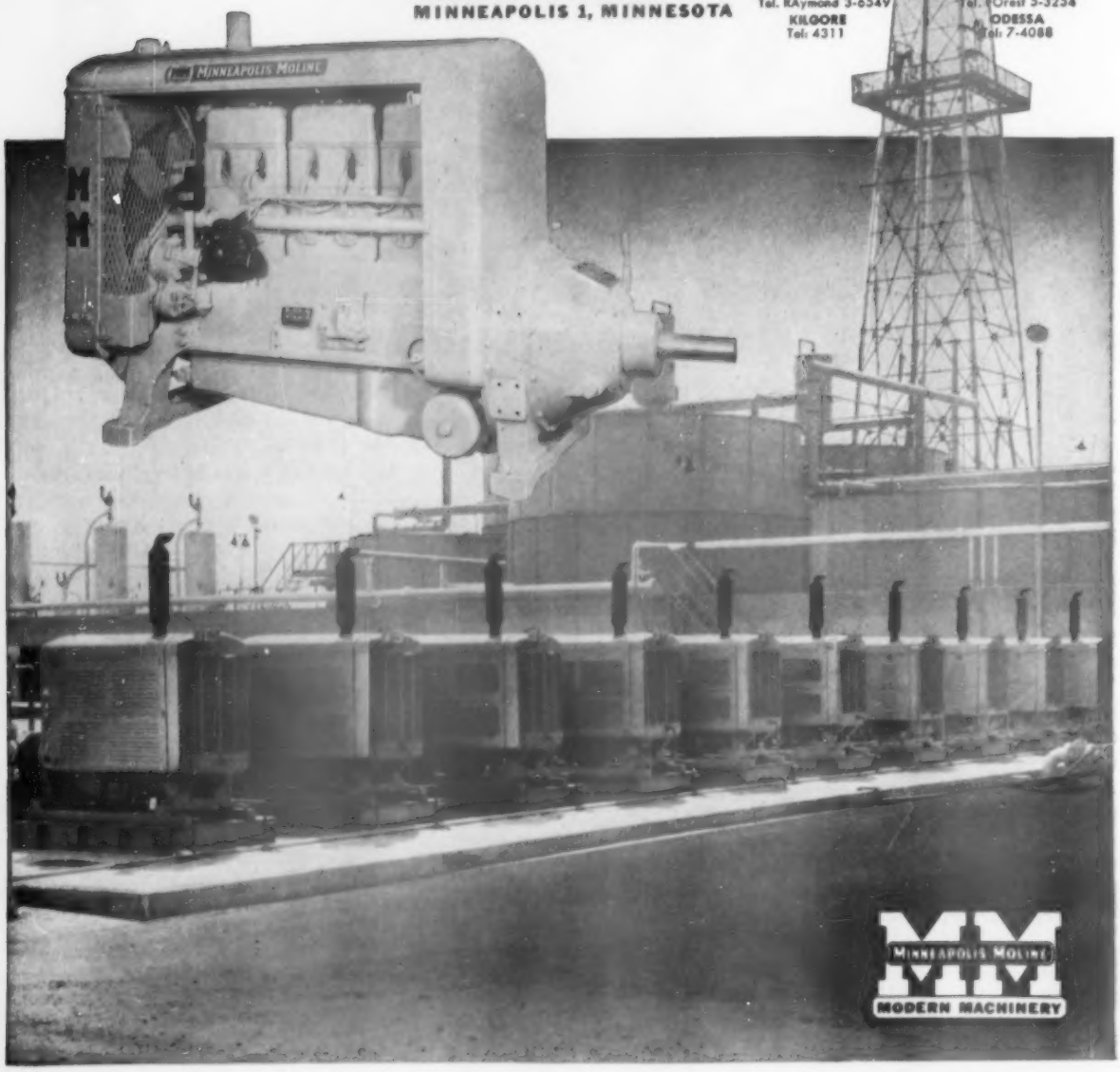


WILDCAT COMPLETIONS

Fred W. Shield 1 Muiky-White, 27-35-T1S-T&P. Dry. TD 3,612 ft.

Reagan County: Texas Gulf Producing Co. 1 TXL, 227-1-T&P. Dry. TD 10,880 ft. Elev. 2,685 ft., Devonian 10,285 ft., Ellenburger 10,655 ft.

Reeves County: Campbell & Meeker 1 Burden, 26-56-T3-T&P. Dry. TD 3,608 ft. Elev. 3,233 ft., Delaware sand 3,456 ft.

Schleicher County: L. E. Scherck 3-A Wilson, Sec. 16, Blk. V14, W. A. Binnion Sur. Dry. TD 5,425 ft.

Sutton County: Ada Oil Co. 1 Rip Ward, 92-B-HE&WT, 1 mile W Sonora. IP 3,000 M.f.g. TD 7,468 ft.

Stanolind Oil & Gas Co. 1-A Miers, Sec. 15, EL&RR Sur., 4 miles NE Sonora. IP 8,200 M.f.g., TP 1,312 psi., Canyon sand pay 5,573 ft., GOR not reported. TD 5,733 ft.

Tom Green County: American Republics Corp. 1 Foster, Sec. 804, German Emigrant Sur., A-287. Dry. TD 6,948 ft. Elev. 2,035 ft., Ellenburger 6,746 ft.

Hanley Co. 1 Johnson, J. R. Craddock Sur. Dry. TD 5,481 ft.

Moore & Gilmore et al 1 Johnson, Sec. 2, J. W. Johnson Sur. Dry. TD 5,404 ft. Elev. 2,106 ft., Strawn 5,250 ft.

Moore & Gilmore 1-31 Johnson, 31-25-H&TC. Dry. TD 6,000 ft. Elev. 2,240 ft., Ellenburger 5,780 ft.

Stanolind Oil & Gas Co. 2-C Johnson, Christian Fosshage Sur. 1809. Dry. TD 6,345 ft.

Stanolind 1-O Johnson, 24-25-H&TC. Dry. TD 6,005 ft. Elev. 2,162 ft., Ellenburger 5,705 ft.

Ward County: Willard M. White 1 Tubb, 24-20-PSL. Dry. TD 4,900 ft.

Winkler County: Blackwood & Nichols 1-7 Amburgey, 7-B9-PSL. Dry. TD 6,528 ft.

WEST TEXAS BORDER COUNTIES

Coke County: American Republic Corp. 2-461 Perciful, J. Baker Sur. 461, A-20. Dry. TD 3,680 ft.

C. T. Robertson 1-A Nora Gee, 118-2-H&TC, 20 miles NW Robert Lee. IP 336 BOPD, 12/64-in., 44°, TP 200 psi., GOR 625 cu. ft., pay perforations 7,067-7,124 ft. TD 7,154 ft.

Union Oil Co. of California 1 Jones, Scrap File Sur. 15,495, 12 miles S Robert Lee. Dry. TD 6,700 ft. Elev. 2,189 ft., Strawn 5,923 ft.

Runnels County: Hill & Henry 1 Werner, Sec. 157, ET&RR Sur. Dry. TD 2,550 ft.

C. T. Robertson 1 Proctor, H&GN Sur. 3. Dry. TD 5,156 ft.

Sojourner Drilling Co. 1 Hoffman, Sec. 161, ETRR Sur. Dry. TD 2,206 ft.

SOUTHEAST NEW MEXICO

Chaves County: Ken Blackford 1 Roberts, 10-15s-26e. Dry. TD 8,440 ft. Elev. 3,394 ft., Ellenburger 8,400 ft.

INDIANA

Dubois County: M. Burkett 1 Jochum, SE NW NW 18-1s-4w. Dry. TD 699 ft.

Orange County: Sahre Cameron 1 Barclay, NW NW SW 17-1n-1e. Dry. TD 2,292 ft.

Spencer County: Robertson & Robertson 1 Schrieber, SW SW NW 14-5s-5w. Dry. TD 1,166 ft.

Sullivan County: Granholm 1 Gerkin, NE NW NE 6-6n-9w. Dry. TD 1,704 ft.

Vigo County: Great Lakes Carbon Corp. 1 Willis, SE NW SW 21-10n-9w. Dry. TD 1,348 ft.

T&H Corp. 1 Shiner, SE NE SW 25-11n-9w. Dry. TD 1,089 ft.

WESTERN KENTUCKY

Butler County: Geo. Nelson 1 Clements, SW SW SE 10-H-32. Dry. TD 510 ft.

G. Nelson 1 Givens, NW SE SE 11-H-32. Dry. TD 610 ft.

G. Nelson 1 Kirby, SE SW SE 12-H-32. IP 8 BOPD, Tar Springs 345-360 ft. TD 366 ft. (Opens Mount Zion North pool).

Crittenden County: Crider-Alexander 1 Bond, NW SW SE 10-J-18. Dry. TD 1,201 ft.

Daviess County: Ryan Oil Co. 1 Hundley, SW NE SW 21-G-27. Dry. TD 1,975 ft.

Henderson County: Eakle & Holder 1 Cogser, SW NE SW 7-P-22. Dry. TD 2,728 ft.

McLean County: Hupp Oil Co. 1 Shacklett, SW NE SE 22-L-27. Dry. TD 2,431 ft.

MICHIGAN

Allegan County: P. K. Degenther 1 Weidenhamer & Plaggemars, NE NE NE 19-3n-15w. Dry. TD 1,369 ft. in Traverse lime.

Mecosta County: McClure Oil Co. 1 Hudson, et al, SE NW NW 20-15n-9w. Dry. TD 3,596 ft. in Dundee-Monroe.

Newaygo County: Max Groom 1 Stone, NW NW NE 27-12n-14w. Dry. TD 2,203 ft. in Traverse lime.

Van Buren County: Norocko Oil Co. 1 Nicholas, NE NW SW 26-3s-15w. Dry. TD 1,080 ft. in Traverse lime.

OHIO

Tuscarawas County: David Ferguson et al 1 W. F. Miller, Lot 10, Clay Township. IP 600 M.c.f. daily, Berea 852-900 ft. TD 900 ft. (New pool).

ALABAMA

Clarke County: Carter Oil Co. 2 Scotch, SW SW 10-10n-1w. Dry. TD 4,297 ft. Elev. 184 ft. Eutaw 3,870 ft.

Monroe County: Gulf Refining Co. 1 Berry-Upton, NW NE 29-5n-4e. Dry. TD 6,112 ft. Elev. 80 ft. Lower Cretaceous 5,791 ft.

MISSISSIPPI

Adams County: D. A. Biglane and Sunnyland Contracting Co. 1-A Giles, 6-7n-3w. Dry. TD 6,500 ft. Elev. 287 ft., Wilcox 4,115 ft., base Baker shal 5,886 ft.

Jett Drilling Co. 1 O'Kelley, 11-5n-2w. Dry. TD 7,006 ft. Elev. 271 ft., Wilcox 4,520 ft., base Baker shale 6,336 ft.

Serio-Punches Oil Co. 2 Emory, 45-6n-2w. IPP 115 BOPD, 39°, Wilcox-Baker sand 6,292-97 ft. (perforations). TD 6,522 ft. Elev. 309 ft., Wilcox 4,420 ft., base Baker shale 6,209 ft., Baker sand 6,269 ft. (New field—Popular Grove.)

Greene County: A. R. Temple and Crawford Drilling Co. 1 Ehlers, NW NW NE 19-3n-6w. Dry. TD 8,499 ft. Elev. 157 ft., lower Tuscaloosa 8,096 ft.

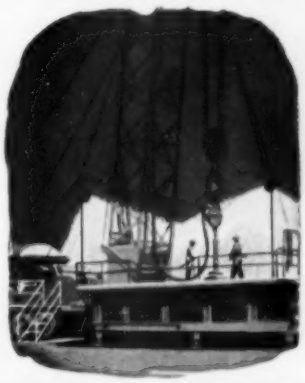
Holmes County: Marshall R. Young et al 1 Board of Supervisors, SW SW 16-13n-1e. Dry. TD 5,540 ft. Elev. 367 ft., Eutaw 5,413 ft.

Jefferson County: Jett Drilling Co. and R. H. Alagood 1 Geoghegan, 45-8n-1e. Dry. TD 6,011 ft. Elev. 216 ft., Wilcox 3,870 ft., base Baker shale 5,886 ft.

Tishomingo County: R. D. Fuller 1 Taylor, C SW SW 7-7s-11e. Junked. TD 1,900 ft.

SOUTH LOUISIANA

Acadia Parish: Continental Oil Co. 1 Estate of J. S. Arceanux, Sr., 3-9s-2e. IP 314 BCPD and 5,410 M.c.f. daily, 12/64-in., 50°, Frio-Homeseekers "E" sand, 12,540-



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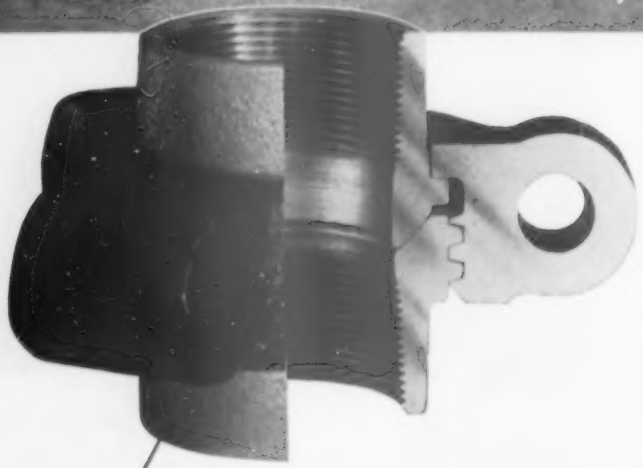

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WILDCAT COMPLETIONS

680 ft. (perforations). TD 13,020 ft. (New pay in Rayne field.)

Calcasieu Parish: Richardson & Bass 1 Drew Manual Training School, 36-8s-8w. IP 214 BOPD, 8/64-in., 37.6°, perforations 8,104-09 ft. TD 10,733. (Extends English Bayou-Gillis field.)

Lafourche Parish: Howell, Holloway & Howell 1 Energy, 65-15s-16e (east flank Chacahoula dome). IP 42 BOPD with 448 M.c.f. daily, 6/64-in., 37°, perforations 12,640-41 ft. TD 14,463 ft. (Extends Chacahoula field.)

NORTH LOUISIANA

Bossier Parish: Zach Brooks Drilling Co. et al 1 S. H. Bolinger & Co., Ltd., 21-23n-13w. Dry. TD 6,679 ft.

Concordia Parish: Norton Oil Co., Inc. C-3 Madison Oil & Development Co., C SW NE 20-6n-8e. Dry. TD 6,609 ft.

R. C. Smith and Crow Drilling Co., Inc. 1 Cox & Johnson, C SW SW 42-6n-9e. Dry. TD 6,510 ft.

LaSalle Parish: Nebo Oil Co., Inc. 15 Nebo Fee, C NW SE 20-7n-3e. Dry. TD 4,327 ft.

Red River Parish: McAlester Fuel Co. A-1 Long Bell Lumber Co., 24-13n-10w. Dry. TD 3,242 ft.

Tensas Parish: Midstates Oil Corp. 1 Harper, 12-10n-12e. IPF 183 BOPD, 9/64-in., 41°, GOR 4,754:1, Massive-lower Tuscaloosa 9,250-72 ft. TD 9,300 ft. (North extension to Rodney Island field).

ARKANSAS

Desha County: Seaboard Oil Co. 1 Anderson-Tully, C NW SW NW 30-10s-1e. Dry. TD 4,825 ft.

Sevier County: C. J. Craft 1 Rendrow, 19-9s-31w. Dry. TD 2,002 ft.

Union County: R. M. Crabtree Producing Co. 1 Swilley, C SW NE SW 1-16s-15w. Dry. TD 3,811 ft.

Woodruff County: Magnolia Petroleum Co. 1 Sturgis, 30-9n-3w. Dry. TD 6,002 ft.

OKLAHOMA

Caddo County: A. B. Ramsey 1 Tsotaddle, SE SW NW 6-5n-11w. Dry. TD 3,003 ft.

Carter County: C. W. Tomlinson 1 Farue, SE NE SW 23-5s-1e. IPF 29 BOPD, 1,709-76 ft., 42°, ¼-in. TD 1,850 ft. (Oil discovery).

W. F. Turner 1 Schaff, SE SW SE 6-5s-1e. IPP 5 BOPD, Deese sand 3,476-3,544 ft., 20.4°. TD 3,833 ft. (Oil discovery).

Cimarron County: The Ohio Oil Co. 1 Perkins, C SE SE 24-1n-6eCM. Dry. TD 6,665 ft.

Garfield County: C. W. Smith 1 Maynard, NW SE NW 11-23n-3w. Dry. TD 2,435 ft.

Garvin County: Davon Oil & Gas Corp. 1 Evans, SE SE SE 5-2n-1w. Dry. TD 5,329 ft.

Grady County: Phillips Petroleum Co. 1 Steve, SE NE 35-5n-5w. IPF 114 BOPD, first and second Bromides, 12,603-806 ft.; 166 BOPD third Bromide, McLish, and Oil Creek sands, 12,885-13,804 ft., ¼-in., 44.6°; 49.7°. TD 14,161 ft. (Deepest oil production in Oklahoma at 13,804 ft. in Oil Creek sand, geological wildcat, ½ mile northeast extension to Bradley pool, new pay for area).

Kay County: Crawford Production Co .1 Kneedler, NE SW SE 1-26n-4e. Dry. TD 3,077 ft.

LeFlore County: Gaines 1 Hendrix, NW NW NW NW 2-2n-24e. Dry. TD 100 ft.

Murray County: Tom Fentem et al 1 Jennings,

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WILDCAT COMPLETIONS

SW SW SW SE 19-1n-4e. Dry. TD 597 ft.

Okmulgee County: F. C. Hines 1 Chancey, SE NW SE 32-11n-12e. IPP and IPF 45 BOPD, Dutcher 2,494-2,506 ft., 42.4°. TD 2,753 ft. (New pay in Weleetka district.)

Osage County: D. R. Lauck 1 Osage, SW SW NW 36-23n-9e. Dry. TD 2,640 ft.

Wylie P. Ballard 1 Osage, NE NE SE 17-25n-5e. Dry. TD 3,757 ft.

Payne County: J. D. Wrather, Jr. 2 Laughlin, NW NE NE 29-20n-2e. IPF 78 BOPD, Cleveland 3,720-30 ft., 20/64-in., 36°. TD 4,835 ft. (Oil discovery).

Stephens County: Mutual Oil & Gas Co. 1 Dunn, NW NW SE 33-2s-4w. Dry. TD 1,450 ft.

Texas County: Kansas-Nebraska 1 Stinson, SE SE NW 3-1n-18eCM. IP 2,351 M.c.f. of gas per day, 2,576-2,614 ft. TD 6,755 ft. (Gas discovery).

Tillman County: Zephyr Drilling Co. 1 Hall, NW NW SW 12-3s-19w. Dry. TD 5,813 ft.

Washita County: Woodward 1 Dunlop, NE SE 31-8n-16w. IPP 10 BOPD, Springer 4,028-48 ft., 30°. TD 6,507 ft. (Oil discovery).

Woods County: Phillips Petroleum Co. 1 Sandra "A", C NW NW 8-26n-15w. IPP 3 BOPD, Mississippian lime 5,910-6,009 ft., 35°. TD 7,567 ft. (Oil discovery).

KANSAS

Cowley County: Rex & Morris 1 Ferguson, NE NW NE 19-31s-8e. Dry. TD 2,810 ft.

Edwards County: Braden Drilling Co.-NACC 1 Mayhew, NW SE SE 33-25s-16w. Dry. TD 4,801 ft.

Ellis County: Nate Appleman 1 Stecklein, NW NW SW 3-12s-19w. Dry. TD 3,760 ft.

Fleming & Woodman et al 1 Landauer, NW NW NW 30-12s-20w. Dry. TD 3,919 ft.

Brunson Drilling Co. et al 1 Shutts, SW SW NE 6-13s-19w. Dry. TD 3,870 ft.

Graham County: Cooperative Refining Association-Derby Oil Co. 1 Andregg, NE SE SW 31-8s-21w. Dry. TD 3,730 ft.

Mid-Continent Petroleum Corp. 1 Herman, NW NW SW 15-10s-24w. Dry. TD 4,544 ft.

Hodgeman County: Bennett & Reoberts 1 McVicar, SW SW NW 6-21s-25w. Dry. TD 4,913 ft.

Kingman County: Berwick-Aurora 1 Albrecht, SW SW SE 18-29s-6w. Dry. TD 4,700 ft.

Petroleum, Inc. 1 Evans, SE SW SE 9-30s-8w. IP 3,500 M.c.f. of gas per day, Miss. 4,156-80 ft. TD 4,695 ft. (Opens Spivey Northwest gas pool).

Kiowa County: Aurora Gasoline-Anschutz Drilling Co. 1 Clarkson, SW SW NW 25-27s-16w. Dry. TD 4,950 ft.

Lyon County: Nemaha Oil Co. 1 Jones, C S½ SW SE 8-21s-10e. Dry. TD 2,901 ft.

McPherson County: National Associated Petroleum Co. 1 Anderson, NW SW NW 22-19s-2w. IPP 70 BOPD, Lansing 2,324-36 ft. TD 2,966 ft. (New pay in Lively field).

Norton County: J. S. Farmer 1 Hansen, SE SE SE 9-2s-25w. Dry. TD 3,766 ft.

Pawnee County: Musgrove Petroleum Co. 1 Fox, NE NE SE 19-20s-18w. Dry. TD 4,215 ft.

Stafford County: Harms & Burt 1 DeBusk, NW NW NE 24-24s-15w. Dry. TD 4,400 ft.

Westpan Hydrocarbon 1 Seever, SW SE SE 6-25s-13w. IPP 14 BOPD, Lansing 3,912-16 ft. TD 4,310 ft. (Opens Seever pool).

Thomas County: Phillips Petroleum Co. 1 Keller "A", NE SW SW 19-9s-32w. IPP 256 BOYD, Marmaton 4,484-94 ft.; 4,525-52 ft. TD 4,747 ft. (New pay in Mingo field).

NEBRASKA

Kimball County: Empire Drilling Co. 1 Funk, SE SE SE 29-13n-54w. Dry. TD 6,250 ft.

Harper-Turner and Dunn & Boreing 1 Stein, SW SW NE 5-12n-54w. Dry. TD 6,162 ft.

Red Willow County: Joe Rothmeier and J. R. Betts 1 Harris, NW NW NW 23-2n-30w. Dry. TD 4,237 ft. granite.

Scotts Bluff County: Alfred Kiespert 1 Wood, C SW SW 15-21n-54w. Dry. TD 4,810 ft.

CALIFORNIA

Glenn County: R. S. Rheem, Operator 1-63 Zumwalt, NE 2-19n-2w, IPF 5,000 M.c.f. gas, 5/16-in. choke, 2,340 psi. casing pressure, perfs. 5,932-44 ft., TD 6,185 ft. (New pool discovery approximately 2 miles northwest of Beehive Bend gas field.)

Kern County: Exeter Oil Co. 11 Murphy-Fee, SW SW 28-32s-24e, IPF 840 BO in 12 hours, 14/64-in. choke, 32° gravity, 790 M.c.f. gas, perfs. 5,315-60 ft., old dry hole deepened from 2,664 ft., TD 5367 ft. (Deeper pool discovery in Midway-Sunset field.)

Pacific Western Oil Corp. 46-12 Socal-Hagood 12-30s-20e. Dry. TD 3025 ft.

(Continued on page 250)

THE OIL AND GAS JOURNAL

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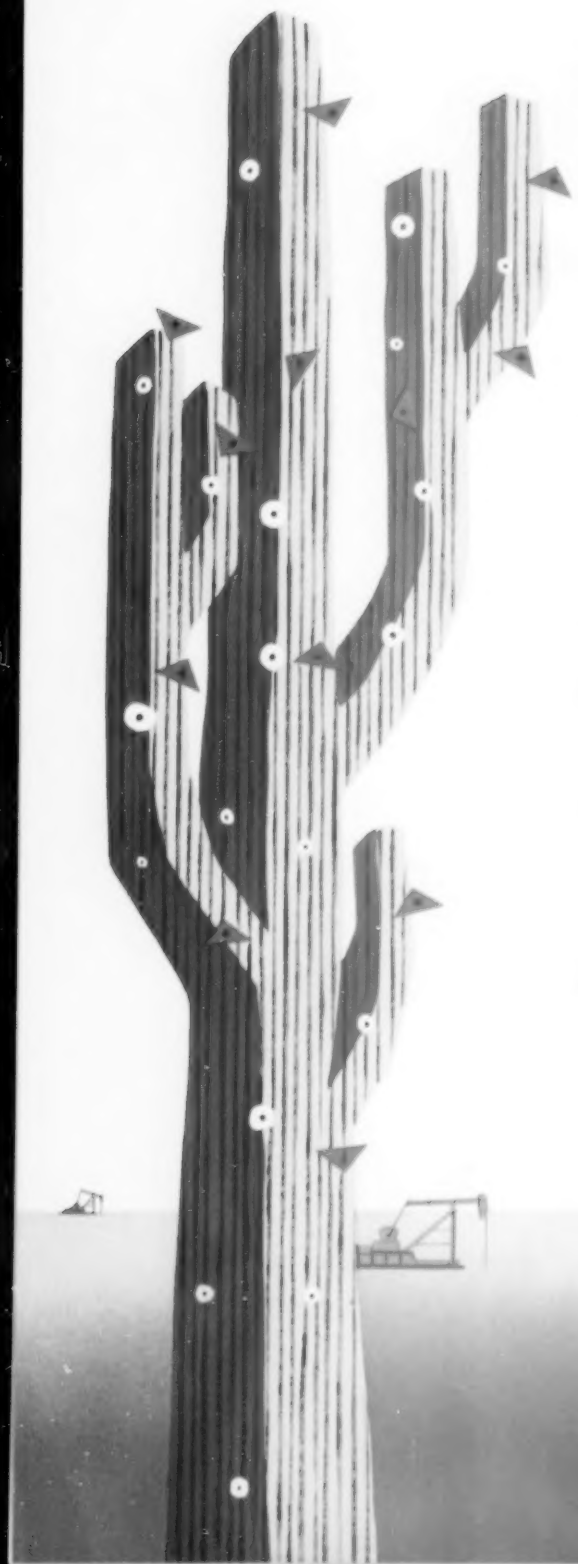
ATPET 931 restores



Many water blocks which have impaired or even cut off production have been removed at exceptionally low cost by means of a new treatment using ATPET 931 . . . a unique interfacial tension depressant developed by Atlas Powder Company. Low producers and dead wells have been restored to top allowable production. Even new wells subject to water damage have been successfully treated.

The process

Developed* by the Stanolind Oil and Gas Company, this new process has been applied successfully to 39 water damaged wells in 9 different formations. Briefly, the process consists of treating the formation with field crude containing approximately 1% ATPET 931. Usually, from 10 to 100 gallons of the chemical is needed per well. The crude oil containing ATPET 931 is forced into the producing formation . . . the chemical reduces the interfacial tension between oil and the water that is blocking the oil flow . . . removes the water block . . . and the well is ready to be produced.

Usually the improvement is noted quickly, although some wells have continued to improve over a period of several months.

What ATPET 931 is

ATPET 931 is an oil soluble, non-ionic surfactant possessing a unique combination of qualities.

- . . . Extremely effective . . . lowers interfacial tension practically to zero even at very low concentrations.
- . . . Non-ionic nature gives optimum performance in presence of varied oil field waters and brines, providing unique detergent action to effect the removal of water.
- ATPET 931 is not a sulfonate or amine and thus avoids the tendency of these compounds to plate out on solid surfaces. Chemically, ATPET 931 is a non-ionic surfactant containing only carbon, oxygen and hydrogen.

*Pat. applied for

productivity of water-damaged wells

Quick pay-out

The cost of using ATPET 931 is extremely low. The simple process normally requires only minimum pumping equipment. The compound's remarkable effectiveness cuts chemical costs. As a result, pay-out time is measured in days instead of months, as illustrated by the case histories. In the evaluation stages of this process, reporting 90 treatments, the average increase in oil production was 13.5 barrels of oil per day including the unsuccessful workovers, and an average pay-out of approximately 20 days was indicated. The average successful workover increased production 32 BOPD per well, for a production increase of 172%. *Here are some case histories:*

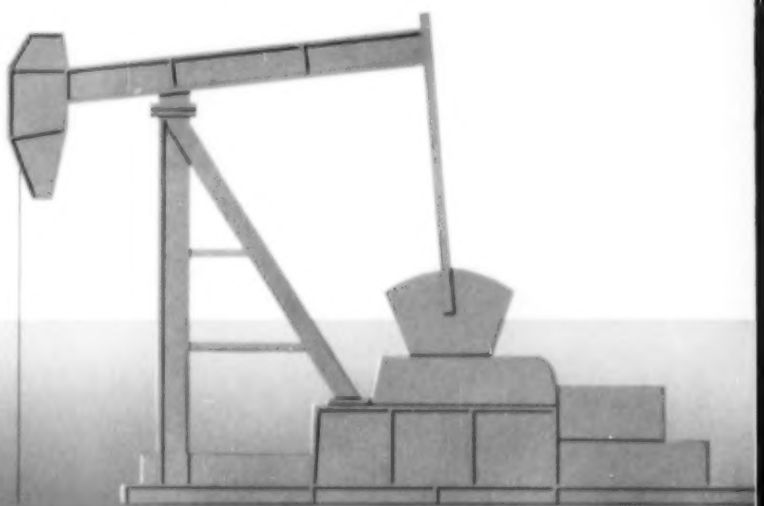
WELL #1 . . . A Gulf Coast well in the Frio sand had been producing 68 BOPD and 204 BWPD flowing when it died. It was treated with 20 gal. ATPET 931 in 20 bbl. oil and is now producing its top allowable of 68 BOPD and 240 BWPD at a 90 psi. T.P.

WELL #2 . . . This well completed in a relatively poor section of the Discorbis sand in 1940 had produced over 220,000 bbl. of oil when an unsuccessful workover in late 1952 killed the well. Several cleanouts and screen repairs were performed but production could not be regained. In early 1953 seven casing leaks were repaired, but salt water flowed into the well from an upper formation for several weeks. Ten gal. ATPET 931 in 1000 gal. of crude oil, was squeezed into the formation at 1000 psi. The well tested 67 BOPD and 20 BWPD flowing. It was later potentialed at 63 BOPD and 27 BWPD using a gas lift. This well is still producing its top allowable of 42 BOPD.

Before treatment the well was considered hopeless and the treatment was in the nature of a last resort.

WELL #3 . . . This West Texas well in the Greyburg formation was producing *12* BOPD and 0 BWPD when it was treated with 5000 gal. crude oil containing 1% ATPET 931. Production was increased immediately to *40* BOPD and 1 BWPD and four months after the workover production had gradually increased to *47* BOPD and 4 BWPD.

WELL #4 . . . This West Texas well in the Greyburg formation was producing *39* BOPD and 3 BWPD when it was treated with 5000 gal. crude oil containing 1% ATPET 931. Ten days after the treatment, no production increase was observed and the treatment was considered a failure. However, three months after the workover, production had increased to *59* BOPD and 3 BWPD.



CHEMICALS DEPARTMENT

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

Production protection applications

Related applications for ATPET 931 which suggest themselves to the treating engineer include the following:

- Completions . . . Where water from mud or drilling operations may damage the formation and as a perforating fluid where water sensitive formations are encountered.
- Recovery of Spent Acid . . . Ahead of acid jobs where recovery of spent acid may be a problem.
- Fracturing . . . Ahead of fracturing jobs to combine the effectiveness of both methods of production stimulation.
- Cementing . . . Ahead of cementing operations where it is feared water from the cement may damage the producing formation.
- Well Logging . . . procedures including the loading of the hole with water . . . ATPET 931 ahead of these operations may aid in regaining production.

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CHEMICALS DEPARTMENT

ATLAS POWDER COMPANY

WILMINGTON 99, DELAWARE

ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

Promotion Welcome

Transfer to Dallas gives executive chance to hunt

BOBWHITES in North and Central Texas are in unusual jeopardy now that Tom C. Frick has moved his family and shotgun to Dallas.

Frick, recently named manager of Atlantic Refining Co.'s production division, had two good reasons for welcoming his promotion from regional coordinating manager at Corpus Christi. First, it was another step up the ladder in his oil career. Second, it meant moving back to good quail-hunting country.

One of the biggest drawbacks to his job at Corpus Christi and at Odessa, Tex. (where he was stationed earlier) was the scarcity of quail in those regions, Frick laments.

He and his 16-year-old son, Charles, have managed to squeeze in a few hours of shotgun-toting since moving back to Dallas. They had an enjoyable, though fruitless, outing after doves in the vicinity of McKinney in North Texas. He hopes to have better luck when he starts looking for quail and duck, his favorite game birds.

Varied career . . . In addition to his family and shotgun, the 46-year-old executive took nearly 30 years of highly diversified oil and gas experience with him when he assumed the job as division production manager for Atlantic.

His first job, at 18, was as gas clerk and laboratory boy for a zinc-smelting firm, Tulsa Fuel & Manufacturing Co., at Collinsville, Okla., in 1925. The smelter obtained gas for fuel from producers in the vicinity of Collinsville, and the job afforded Frick an opportunity to rub elbows with oil men. He developed an interest in the oil business and quit his job with the smelting firm to work a year as a roustabout and tool dresser for various drilling contractors in northeastern Oklahoma.

In 1927, he joined Independent Oil & Gas Co., Tulsa, as a clerk and meter man. With a good working man's knowledge of the oil industry, Frick resigned his job in 1929 to study petroleum engineering at the University of Tulsa. He was graduated in 1933 with a B. S. degree in petroleum engineering and extra credits from summer-school work in economics, government, and public speaking.

After obtaining his degree, he worked 3 years as a clerk and engineer in the processing and costs department of Phillips Petroleum Co.'s refining division at Bartlesville, Okla. He then returned to the University of Tulsa, where he served as an associate professor of petroleum engineering until 1941. He spent his summer vacations during this 5-year period working in the oil fields and doing consulting work.

Frick joined Atlantic at Dallas in 1941 as job analyst for the Southwest division. He returned to active production work in 1944, transferring to Longview, Tex., as district production superintendent. Three years later he moved to Odessa as operations superintendent of Atlantic's West Texas-New Mexico region. He went to Corpus Christi in 1951 as regional coordinating manager over the operations, exploration, and land departments.

Other interests . . . In addition to their son, who is a junior at Hillcrest High School in Dallas, Tom and his wife Aina have a 19-year-old daughter, Martha, a sophomore at the University of Tulsa.

Tom Frick has been an elder in the Presbyterian Church for many years, and has joined the Preston Hollow Presbyterian Church since moving to Dallas.

This year he is a vice chairman of the petroleum branch of the American Institute of Mining and Metallurgical Engineers and serves as chairman of that association's advertising committee. He also is a member of the production division of the American Petroleum Institute.

Gordon Fix, former staff geologist for Carter Oil Co. at Mattoon, Ill., has been transferred to Grand Rapids, Mich., as assistant division geologist.

J. O. Haynes, former engineer with Placid Oil Co. at Shreveport, has been promoted to district superintendent at Houma, La.

Edmund A. J. Mroz, former member of the process engineering department of Stone & Webster Corp., Badger Process Division, has opened chemical engineering consulting offices in Melrose, Mass.

Lauren B. McCann, planner in the maintenance division of California Oil Co. has been transferred to Bahrain Petroleum Co. on Bahrain Island in the Persian Gulf as assistant maintenance supervisor.

Nelson Y. Ruth, a director of Carter Oil Co., has been named assistant coordinator of the producing-coordination group of Standard Oil Co. (N. J.), effective November 1. Ruth has been with Carter for 27 years and was a member of the first seismograph crew placed in the field by Carter in 1931. He was named manager of the land department at Tulsa in 1946 and in 1947 was appointed head of the exploration department. He was elected to the board of directors in 1953. **Dr. Richard N. Meinert,** associate chief of research at Carter's research laboratory in Tulsa, has been named associate coordinator of production research in the producing-coordination department of Jersey. Meinert joined the Standard group in 1936 when he went to work with Standard Oil Development Co. after 6 years as an instructor at Brown University. He was named assistant chief of research for Carter in 1947.

NELSON Y. RUTH

DR. MEINERT

A. W. Scott, president of Wolf's Head Refining Co., Oil City, Pa., was reelected president of the National Petroleum Association at the fifty-second annual meeting in Atlantic City. Other officers reelected are: **Fred G. Bannerot, Jr.,** Elk Refining Co., Charleston, W. Va., first vice president; **Paul R. Beck,** Pennsylvania Refining Co., Butler, Pa., second vice president; **E. M. Lyons,**

PERSONALS

Philadelphia, recording secretary; **G. B. Hunter,** Quaker State Oil Refining Corp., Oil City, treasurer; and **Fayette B. Dow,** Washington, D. C., general counsel.

John L. Hada, Jr., has joined **V. C. Perini, Jr.,** at Abilene, Tex., as a geologist. Before joining Perini, Hada was a geologist with Lone Star Gas Co. at Dallas.

Duane A. Crawford has rejoined Ohio Oil Co. as a junior petroleum engineer at Shelburn, Ind., after serving with the U. S. Army Corps of Engineers at Fort Leonard Wood, Mo.

R. B. Tuttle, equipment editor of The Oil and Gas Journal, has been awarded a certificate of appreciation by the American Society of Mechanical Engineers. Tuttle, who is widely known throughout the petroleum industry, has been with the Journal for 10 years. He was cited for outstanding service to the engineering profession, the petroleum industry, and to the petroleum division of A.S.M.E. Other recipients of the certificates are: **Max P. Watson,** United Gas Pipe Line Co.; **David P. Thornton, Jr.,** Petroleum Processing; **Winfred H. Stueve,** consulting engineer of Oklahoma City; **L. F. Strader,** Richfield Oil Corp.; **S. Mensonides,** Farrar & Trefts; **D. E. Fields,** Flint Steel Corp.; **C. R. Draughon,** Esso Standard Oil Co.; and **F. J. Daasch,** Rock Island Arsenal Research Laboratory of the United States Defense Department.

E. L. Fipps has been named district geologist in charge of the newly opened Jackson, Miss., office of Plymouth Oil Co.

C. E. Greenwood has been named assistant to southern regional geologist by Continental Oil Co. Greenwood joined Conoco in 1949 and has been district geologist at Corpus Christi since 1951.

Gerardo Lopez, former export manager of Petroleos Mexicanos, has been named head of Pemex's offices in New York City. **Teodoro Reith,** a former official in the refining division, has been appointed to succeed Lopez as export manager. **Fernando Padilla,** former head of the New York office, is now serving as subsecretary in charge of finance.

Richard L. Robinson has rejoined Standard Oil Co. of Texas as a petroleum engineer at Sherman, Tex., following a 2-year tour with the U. S. Air Force. Before going into the service, Robinson was with Stanotex at Iraan, Tex.

W. W. Kessler has been named area geologist in charge of the newly created Shawnee, Okla., office by Carter Oil Co. **Leslie P. Hellen, Jr.,** has been appointed area geologist in charge of the new Ponca City, Okla., office. Both offices are under the Oklahoma City division office headed by **J. J. Mullane.** Geologists serving at the Shawnee office are **Charles D. Claxton, John B. Elder, Vorin J. Welch,** and **Richard S. Shaw, Jr.** Geologists at Ponca City are **Elza M. Sanders** and **John P. Bush.**

C. W. (Cliff) Kennedy has been named chief engineer of the production division of Consumers Co-Operative Refineries, Ltd. Kennedy joined Co-Op in 1939 at its Regina refinery and has been serving as assistant superintendent.

Roger C. Hamil, Jr., formerly district petroleum engineer in Brookhaven, Miss., for Humble Oil & Refining Co., has resigned to become vice president in charge of a new oil and gas department set up by the Victoria Bank & Trust Co., Victoria, Tex.

B. G. Christopher, mechanical engineer with Magnolia Pipe Line Co.'s western division at Midland, Tex., and

CHRISTOPHER

L. D. JACKSON

Larry D. Jackson, welder foreman at the firm's Corsicana, Tex., terminal, have been loaned to the U. S. Defense Department for a 6-month tour of duty at Melun, France, with the joint construction agency of the U. S. European Command. Christopher will serve as resident engineer, Jackson as field engineer during the construction of a products pipeline being laid from the port of St. Nazaire on the Atlantic coast to Metz, near the northern boundary of the country.

George M. Parker has been elected president of Esso Export Corp., international sales affiliate of Standard Oil Co. (N.J.). Parker succeeds **William J. Haley,** who has retired after 40 years of service with Jersey affiliates. Haley joined the company in 1914 and after a series of promotions, served in executive capacities at refineries in Baton Rouge, La., Charleston, S. C., and Havana, Cuba. In 1944 he became coordinator of Jersey Standard's worldwide refining operations, and in 1950 he became president of Esso Export. Parker, in his new capacity, also becomes president of Mediterranean Standard Oil Co., and three other newly

Officers Select Date For First Fall Technical Meeting

Officers of Tulsa Geological Society met last week and formulated plans for the group's first fall meeting. October 4 was chosen as the date and the petroleum sciences building at the University of Tulsa will be the site. Officers who attended the meeting are (left to right): C. A. Weintz, Stanolind Oil & Gas Co., business manager; E. T. Benson, Service Pipe Line Co., first vice president; H. T. Morley, Stanolind, president; D. L. Norling, Anchor Petroleum Co., secretary-treasurer; and A. C. Austin, Ohio Oil Co., editor. R. J. Lantz, Union Oil Co. of California, was unable to attend the meeting.

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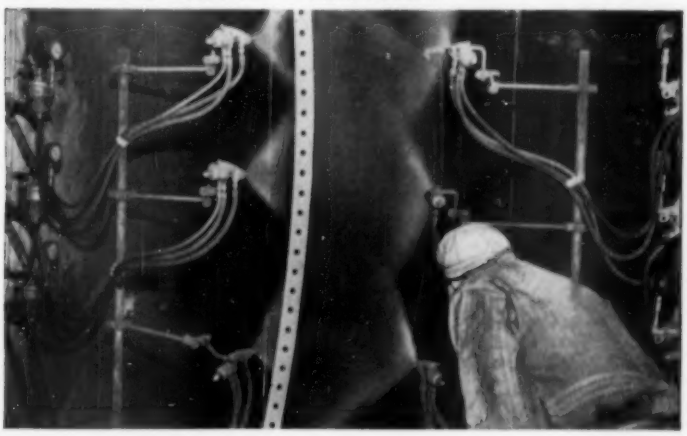

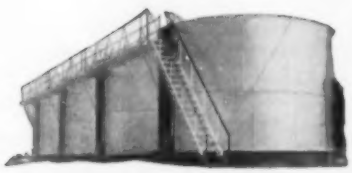

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PERSONALS

formed Jersey affiliates, Staniraq, Ltd., Mediraq, Ltd., and Esso Trading Co. of Iran.

Al Perkins, production engineer with Spartan Drilling Co., has been transferred from Magnolia, Ark., to Sinton, Tex.

C. E. Black, geologist with Texas Crude Oil Co., has been transferred from Houston to Lafayette, La.

D. C. Collins has been promoted to division petroleum engineer, eastern division, with headquarters in Silsbee, Tex., by American Republics Corp. **Hugh F. Smith** has been promoted to petroleum engineer for the Silsbee district, replacing Collins.

Joseph H. King, president of Union Securities Corp., New York, and **William E. Walker,** Dallas, have been elected directors of Natural Gasoline Corp., succeeding **P. C. Spencer** and **Joseph P. Walsh,** who have resigned.

Dr. Hubert C. Skinner has joined The Texas Co. as a geologist at New Orleans. Before joining Texaco, Skinner was an instructor in geology at the University of Oklahoma, where he recently received his Ph. D.

F. H. Cummins, pipeline maintenance foreman with Shell Pipe Line Corp. at Tecumseh, Okla., has been transferred to Sterling, Colo., as maintenance supervisor.

Dr. W. C. Francis has joined Spencer Chemical Co. at its central research laboratory at the Jayhawk plant, near Pittsburg, Kans. Francis has been studying at Cambridge University in England on a Fulbright scholarship.

Herbert R. Straight, Cities Service executive and one of the Mid-Continent's best-known oil men, celebrated his eightieth birthday in Bartlesville, September 30. Straight, still a Cities Service Co. director, retired as an active officer in 1947 after 27 years in the Cities Service organization. He entered the oil business in Pennsylvania in 1897 and was production manager for several Oklahoma companies between 1912 and 1920, when he joined Empire Gas & Fuel Co., predecessor of Cities Service Oil Co. He held many executive positions with Cities Service and its affiliates, including the presidency of Cities Service Oil Co. and Empire Pipeline Co.

B. R. Kemp has been named managing director of Sui Gas Transmission Co., Ltd., and Pakistan Petroleum, Ltd. Sui Gas is now building a gas line from Sui field to Karachi, Pakistan.

Charles M. Wanner, geologist with Carter Oil Co., has been transferred from Riverton, Wyo., to Carmi, Ill.

Richard L. Saunders, vice president and director of The Texas Co., has retired after 45 years of service with the company. Saunders joined Texas in 1909 and worked up through various clerical and sales positions until 1938 when he was named secretary of The Texas Co. He was elected a vice president of the firm in 1944 and in 1946 was elected to the board of directors.

Miss Marion Goudie, senior geologist with Saskatchewan Department of Mineral Resources, has taken a year's educational leave to take a post-graduate course in sedimentary geology at the Imperial College of Science in London.

Glen F. Bish has been named assistant manager of the production department by Ohio Oil Co. at Findlay, Ohio. Before his promotion, Bish had been serving as Tulsa division manager for Ohio. Bish was appointed manager at Tulsa in 1946 and in his 8 years there had been active in all types of civic work. **E. B. Stewart,** who formerly served under Bish in Tulsa as production superintendent, will come from his position as Terre Haute, Ind., division manager to succeed Bish. Other promotions announced by Ohio are: **E. B. Emery,** director and vice president, advanced to coordinator of the company's exploration and production; **F. E. Smith,** assistant manager of production, promoted to production manager; **G. F. Poe,** general superintendent of production, also named an assistant production manager; **J. D. Anderson,** assistant division manager at Houston, made division manager at Terre Haute; **I. G. Burrell,** assistant to the manager of production at Findlay, named assistant division manager at Houston; **O. V. Henry,** division superintendent of production at Houston, advanced to general superintendent of production at Findlay; and **J. A. Grimes, Jr.,** assistant superintendent of production at Houston, promoted to Houston division superintendent.

Douglas H. Harnish, Jr., has been named head of the department of petroleum engineering at Montana School of Mines at Butte. Harnish, formerly was a petroleum-research engineer at the University of West Virginia and before that had served with Pure Oil Co. as an engineer in Illinois and West Virginia.

DEATHS

Wallace B. Pardoe, 56, independent oil operator of Tulsa, died at his home September 29 following a short illness. Pardoe had worked for Sinclair Oil Co. and Shell Oil Co. before becoming an independent in 1931.

Irving M. Smith, 56, city attorney for Long Beach for the past 16 years and a key figure in the Long Beach fight over the tidelands, died at his home September 27.

H. C. Turner, 38, owner of the Turner Drilling Co., was killed in an automobile crash at Forsyth, Mo., September 27. Turner had lived most of his life in Wichita and at one time was vice president of John Landis Oil Co. there.

Sylvester Davis Swain, 66, pioneer independent operator near Bartlesville and Ramona, Okla., died recently in Indianapolis.

Dr. Walter F. Rittman, 71, pioneer petroleum chemist and inventor of a petroleum cracking process, died recently in Pittsburgh.

P. J. Ryan, store manager and field representative for Bethlehem Supply Co. at Graham, Tex., died there recently following a long illness.

Edmond Scott White, 72, geologist at Marshall, Tex., was killed September 23 when his car overturned near Okmulgee, Okla.

Horace M. Alexander, 59, Dallas independent oil operator, died recently in Dallas.

Dennis L. Smith, 38, production foreman for Atmore Drilling Co., died September 26 following an automobile accident near Chickasha, Okla.

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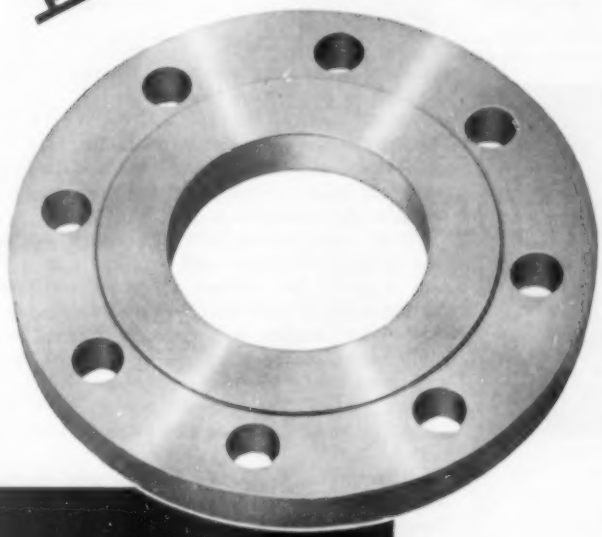

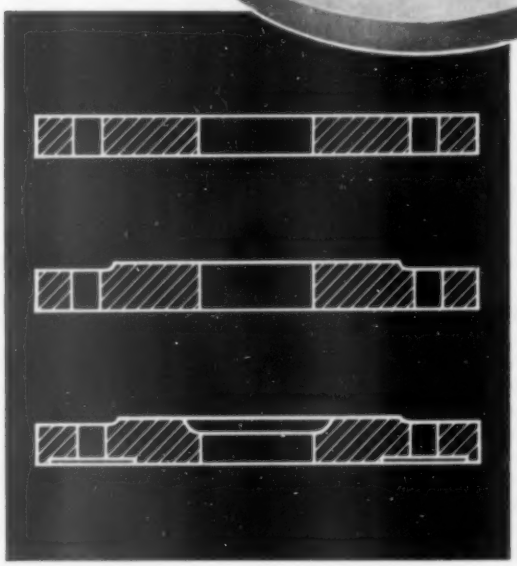

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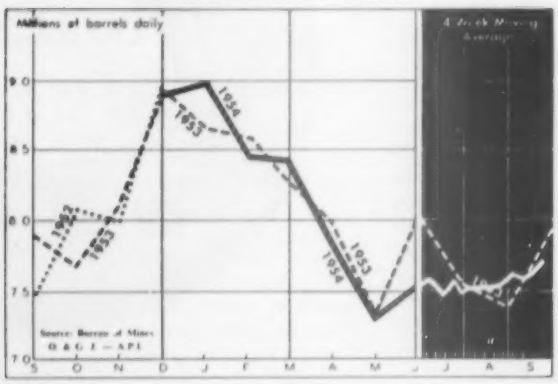
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,172,450	DOWN	23,600	DOWN	379,722
Crude stocks	272,695,000	DOWN	642,000	DOWN	10,882,000
Completions	1,054	UP	136	UP	9
Refinery runs	6,999,000	UP	30,000	UP	119,000
Gasoline stocks	151,145,000	DOWN	642,000	UP	10,847,000
Four-product stocks	372,163,000	UP	1,443,000	UP	17,652,000
Total imports	1,196,400	UP	322,400	UP	333,400

TOTAL DEMAND – ALL OILS



Light Heating Oil Markets Are Firmer in All Demand Areas

LIGHT heating oils are gaining strength in most market areas. The major factor in the firming market picture is the relative stock position of middle distillate. Starting with January of this year, middle-distillate stocks have shown very little change over corresponding months of last year.

Middle-distillate stocks from the latest weekly A.P.I. report are about the same as last year. Weather was abnormally warm during the heating season a year ago. Enough burners have been added since the start of last year's heating season to insure a reasonable gain in distillate demand even if the weather is no colder than last winter.

If the weather is about normal during the coming heating season production of middle distillate will have to be increased by higher yields as well as increased refinery runs. With this outlook for higher demands and with reasonable stocks at the start of the season, kerosine and distillate prices may move up enough to help promote the shift in yields from gasoline to light fuels.

Market changes . . . Cargo prices for light fuels on the Gulf Coast moved up 0.125 cent a gallon early in the last week of the month, and for the present the market seems to be stabilized at that level.

With a cargo price of 8.375 cents a gallon for No. 2 fuel at the Gulf Coast and a tanker rate of about 0.75 cent a gallon for delivery to points north of Hatteras, the old price of 8.95 cents a gallon for barge delivery in New York Harbor will not cover actual costs. As a result, most of the suppliers in the New York Harbor area have raised the barge price for No. 2 fuel to 9.35 cents a gallon. The few still quoting 8.95 cents are expected to move up, since this price is below replacement cost.

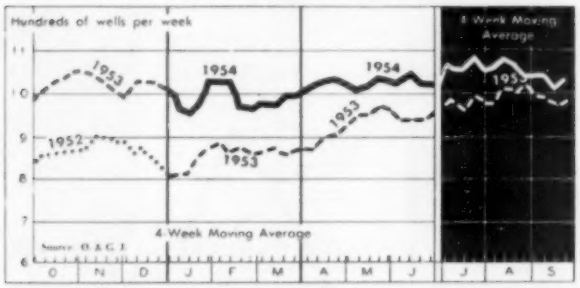
Esso Standard Oil Co. announced increases in its wholesale prices of kerosine and No. 2 distillate effective September 28. In general, the increases in No. 2 prices ranged from 0.25 cent to 0.5 cent a gallon. The New York Harbor price was raised 0.4 cent. Increases for kerosine averaged about 0.25 cent a gallon less than the changes for No. 2 fuel.

Group 3 distillate has been selling at pipeline terminals slightly under the normal Group 3 quotation plus pipeline charges. Suppliers of some of this discount material have given notice that prices will be up 0.125 cent a gallon, effective the first of October.

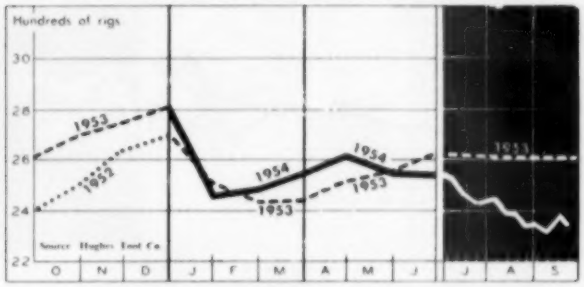
Gasoline markets . . . Motor-fuel stocks continue well above desirable end-of-the-season levels. Some suppliers have expressed hope that shifts in yields and reduced runs will prevent enough additional buildup of stocks to stall off further market breaks.

Announced reductions in tank-wagon prices for some of the North Central states, starting about September 20, tended to bring these prices more in line with actual spot prices at pipeline terminals. In other inland areas the differential is still enough to promote price wars at jobber and service-station levels.

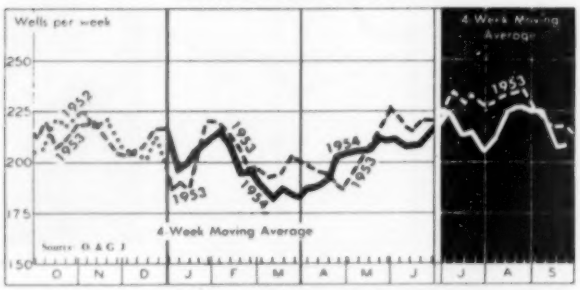
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

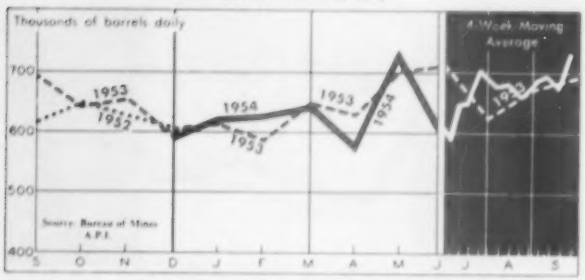
Area—	9-27-54	Change from 9-20-54	Change from 9-28-53
Gulf Coast	491	—22	— 49
N. and W. Texas-New Mexico	729	— 4	— 57
Arkansas-N. Louisiana-E. Texas	185	— 2	— 1
Oklahoma	276	— 6	— 82
Kansas-S. Nebraska	163	— 1	2
Illinois-Eastern	125	—23	— 31
Rocky Mountain	250	5	— 22
Pacific Coast	128	2	— 48
Total United States	2,347	—51	—288
Western Canada	120	— 1	— 62

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 25, 1954

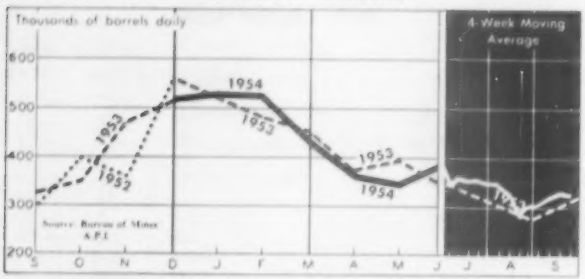
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1954				
	Comp.	Oil	Gas	Dry	Footage	1954	1953	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	10,409	82	106	0	0	0	2	2	2	0	2	71	75
Arkansas	20	14	0	6	67,748	475	399	0	0	0	4	4	20	0	4	92	116
California	44	33	1	10	194,473	1,739	1,897	1	0	1	6	8	46	0	10	380	437
Colorado	25	11	0	14	139,052	964	510	0	0	0	11	11	27	0	14	389	430
Illinois	63	40	0	23	156,175	2,075	1,428	0	0	0	0	0	8	0	0	233	241
Indiana	23	6	1	16	31,403	587	961	0	0	0	6	6	7	0	0	107	114
Kansas	95	41	9	45	336,343	3,366	3,606	3	0	1	14	18	61	0	17	449	527
Kentucky	31	9	5	17	52,535	832	815	1	0	0	6	7	14	0	3	87	104
Louisiana	87	56	5	26	474,029	2,613	1,947	3	1	0	5	9	84	43	29	257	413
North	50	36	5	9	136,126	1,433	827	1	0	0	5	6	12	3	11	108	134
South	37	20	0	17	337,903	1,180	1,120	2	1	0	0	3	72	40	18	149	279
Michigan	11	6	0	5	23,967	414	434	0	0	0	4	4	13	0	0	154	167
Mississippi	10	3	0	7	59,438	301	271	1	0	0	6	7	9	1	0	107	117
Montana	13	5	2	6	69,537	239	310	1	0	1	6	8	4	0	2	78	84
Nebraska	10	4	0	6	56,173	313	251	0	0	0	4	4	18	0	3	94	115
New Mexico	16	10	3	3	80,156	801	1,043	0	0	0	1	1	13	0	15	82	110
North Dakota	6	5	0	1	44,756	216	190	0	0	0	1	1	4	0	0	80	84
Ohio	23	7	7	9	36,919	847	783	0	0	1	0	1	3	0	5	13	21
Oklahoma	159	89	10	*60	552,611	6,741	5,503	7	0	1	11	19	90	3	19	494	606
Pennsylvania-New York	30	12	4	†14	58,763	1,726	1,925	0	0	0	0	0	0	0	6	30	36
Texas	342	200	13	129	1,745,347	13,651	12,660	12	5	5	83	105	596	59	135	3,109	3,899
Southwest (1 & 4)	39	21	3	15	185,359	1,959	2,050	1	0	1	10	12	83	24	38	534	679
Gulf Coast (2 & 3)	45	29	3	13	309,024	1,973	1,858	2	4	2	13	21	63	29	41	499	632
East (5 & 6)	26	11	0	15	165,379	713	586	0	0	0	10	10	12	0	13	216	241
North Central (7-B & 9)	113	62	0	51	424,585	5,093	4,799	3	0	0	25	28	270	4	16	1,243	1,533
West (7-C & 8)	103	68	3	32	596,763	3,173	2,782	6	0	2	23	31	165	0	19	550	734
Panhandle (10)	16	9	4	3	64,237	740	585	0	1	0	2	3	3	2	8	67	80
Utah	4	0	0	4	18,566	55	50	0	0	0	3	3	3	0	1	30	34
West Virginia	21	6	14	1	57,645	439	451	0	0	1	0	1	0	0	23	13	36
Wyoming	18	14	0	4	75,507	946	545	0	0	0	1	1	29	0	6	142	177
Miscellaneous (Nev.)	1	1	0	0	10,358	94	59	1	0	0	0	1	3	0	0	25	28
Total United States	**1,054**	572	74	408	4,351,910	39,516	36,144	30	6	11	174	**221**	1,054	107	294	6,516	7,971
Total previous week	918	503	74	341	3,558,899	.....	.....	17	1	11	144	173	1,024	101	283	6,342	7,750
Total Sept. 26, 1953	1,045	549	90	406	4,097,145	.....	.....	33	4	3	181	221	1,091	80	276	6,754	8,201

Service wells included: *8, †7.

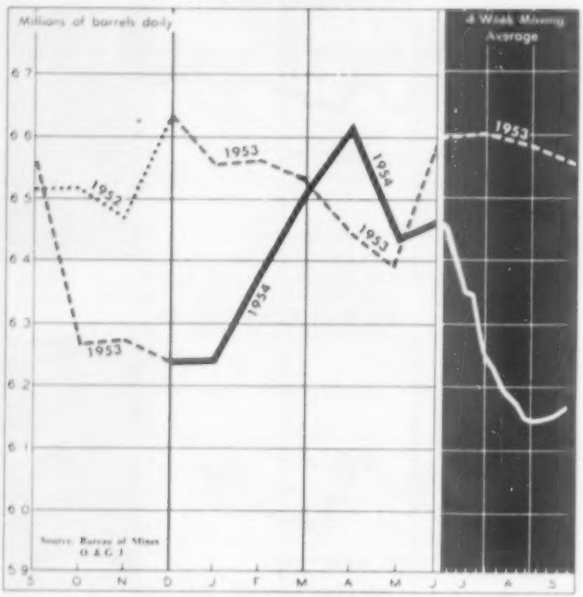
CRUDE IMPORTS



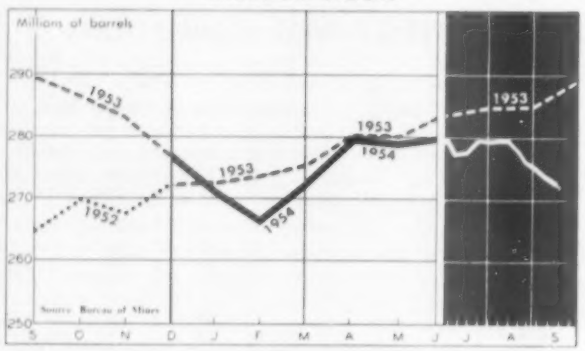
PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



CRUDE-OIL STOCKS



DAILY AVERAGE PRODUCTION FOR WEEK

	September 25			Sept. 18
	Crude oil	Lease condensate	Total	total
Alabama	4,200		4,200	4,100
Arkansas	76,250	500	76,750	76,750
California	959,100		959,100	962,000
Colorado	127,900		127,900	128,100
Eastern	54,000		54,000	55,200
Florida	1,500		1,500	1,500
Illinois	181,900		181,900	182,700
Indiana	27,800		27,800	27,500
Kansas	317,200		317,200	318,200
Kentucky	37,700		37,700	36,700
Louisiana	579,550	40,500	620,050	625,350
North	103,900	2,500	106,400	111,700
South	475,650	38,000	513,650	513,650
Michigan	30,800		30,800	32,400
Mississippi	87,500	3,000	90,500	90,400
Montana	39,100		39,100	41,900
Nebraska	19,000		19,000	19,200
New Mexico	205,400	1,650	207,050	206,950
Oklahoma	496,700		496,700	505,200
Texas	2,564,200	45,500	2,609,700	2,609,700
Dist. 1	41,900	400	42,300	42,300
Dist. 2	128,700	6,050	134,750	134,750
Dist. 3	404,000	22,200	426,200	426,200
Dist. 4	225,600	5,200	230,800	230,800
Dist. 5	43,500	350	43,850	43,850
Dist. 6	109,000	4,600	113,600	113,600
East Texas field	209,500		209,500	209,500
Dist. 7-B	134,000	25	134,025	134,025
Dist. 7-C	172,000	4,500	176,500	176,500
Dist. 8	831,000	1,900	832,900	832,900
Dist. 9	181,000	250	181,250	181,250
Dist. 10	84,000	25	84,025	84,025
Utah	4,900		4,900	4,300
Wyoming	252,200		252,200	253,200
North Dakota	‡14,400		‡14,400	‡14,700
Total U. S.	6,081,300	91,150	6,172,450	6,196,050
Change from previous week, down			23,600	
Canada	†312,900		†312,900	†313,450
Total U. S. production January 1-September 25			1,703,044,550 bbl.	
Same period last year (crude plus cond.)			*1,751,856,914 bbl.	

*Includes 24,305,500 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100 bbl.

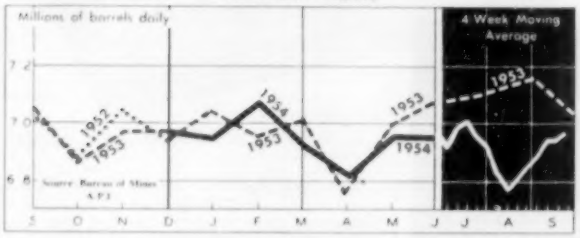
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

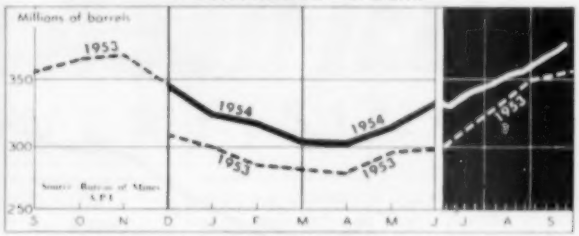
	Sept. 18, '54	Sept. 11, '54	Sept. 19, '53
Pennsylvania Grade	3,116	3,045	2,729
Other Appalachian	1,572	1,526	2,256
Illinois, Indiana, Michigan	12,800	12,224	12,140
Kansas	9,862	9,991	10,370
Oklahoma	24,517	24,408	31,274
Arkansas	3,308	3,207	3,057
Louisiana	16,003	15,526	16,768
North	2,555	2,593	2,731
Gulf	13,448	12,933	14,037
Mississippi	3,106	2,803	3,686
New Mexico	8,956	8,692	9,638
Texas	128,223	129,668	131,265
East Texas proper	11,125	10,867	11,030
West Texas	57,058	57,409	59,490
Texas Gulf	25,333	26,135	28,008
Other Texas	34,707	35,257	32,737
Wyoming	12,618	12,316	13,726
Other Rocky Mountain	5,336	5,835	3,095
California	32,701	33,207	33,248
Foreign	†10,577	10,889	10,325
Total	272,695	273,337	283,577

*Bureau of Mines. †Includes 2,882,000 bbl. in California.

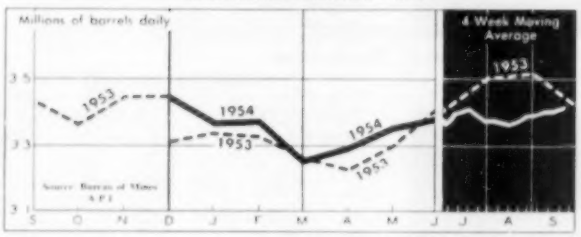
REFINERY RUNS



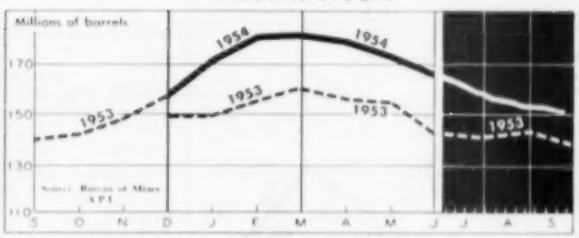
FOUR-PRODUCT STOCKS



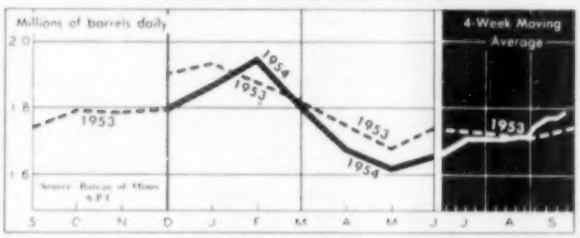
GASOLINE PRODUCTION



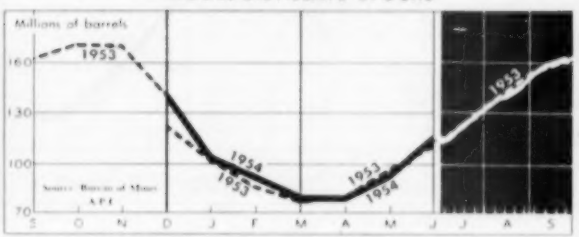
GASOLINE STOCKS



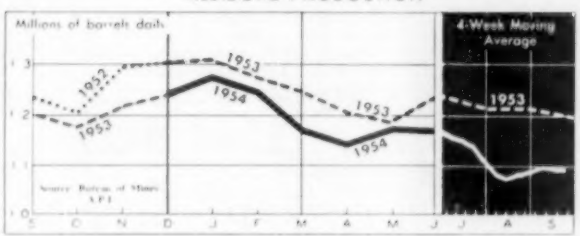
MIDDLE-DISTILLATE PRODUCTION



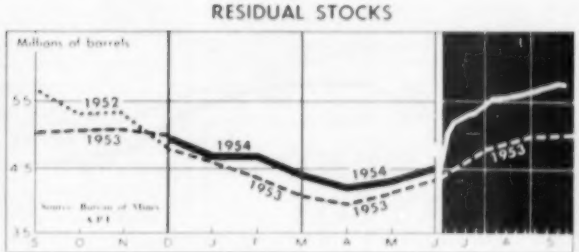
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, SEPTEMBER 24

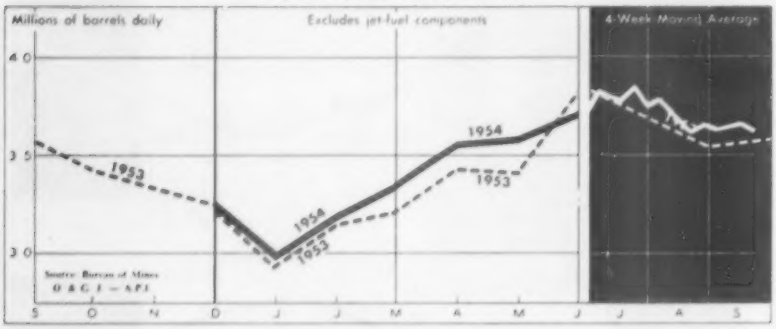
(Excludes all jet-fuel components)

(Thousands of barrels)

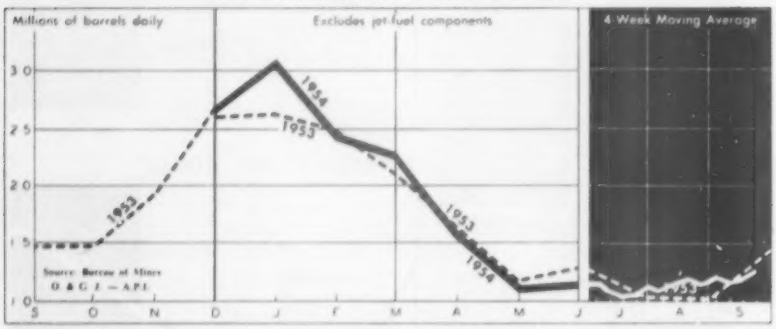
District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1953: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,076	449.1	30.0	299.0	193.2	35,127	14,949	45,437	11,269	1,052	420.8	35.2	249.6	227.9
Appalachian:														
District 1	109	47.4	3.2	24.7	7.4	4,317	706	2,238	470	107	46.1	5.0	20.4	11.3
District 2	71	36.4	2.3	11.9	6.1	2,223	408	767	299	85	48.5	5.3	12.6	11.1
Ind., Ill., Ky.	1,221	678.0	77.0	223.8	123.7	34,144	9,846	25,389	4,697	1,278	717.1	71.3	218.9	166.7
Okla., Kans., Mo.	564	316.4	20.1	119.7	41.2	14,075	2,511	12,650	1,219	583	353.9	17.7	134.9	45.0
Inland Texas	238	176.9	9.0	47.7	21.4	5,370	360	2,430	1,306	239	179.8	10.4	44.4	29.9
Texas Gulf Coast	1,753	807.4	112.4	385.1	234.4	19,275	4,827	14,761	6,833	1,691	835.3	118.3	398.1	238.8
La. Gulf Coast	559	314.2	55.0	145.4	44.4	8,767	2,969	4,499	1,320	546	280.9	51.1	138.9	43.2
N. La. and Ark.	94	35.4	7.4	21.9	5.2	3,837	1,045	1,393	144	86	35.9	6.8	19.1	6.4
Rocky Mountain:														
New Mexico	18	11.6		3.0	2.7	260		82	36	18	11.3	0.4	3.0	2.9
Other Rocky Mtn.	249	112.3	6.0	54.9	42.4	5,719	246	2,759	936	259	125.3	3.3	54.8	42.0
California	1,047	439.9	3.3	157.3	344.9	18,031	345	13,166	28,706	1,079	466.3	5.1	153.1	378.1
Sept. 24, 1954	6,999	3,425.0	325.7	1,494.4	1,067.0	151,145	38,212	125,571	57,235	7,023	3,521.2	329.9	1,447.8	1,203.3
Sept. 17, 1954	6,969	3,407.4	330.4	1,435.3	1,101.0	151,787	37,644	124,021	57,268					
Sept. 26, 1953	6,880	3,326.6	316.6	1,382.3	1,151.7	140,298	36,405	125,872	51,936					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

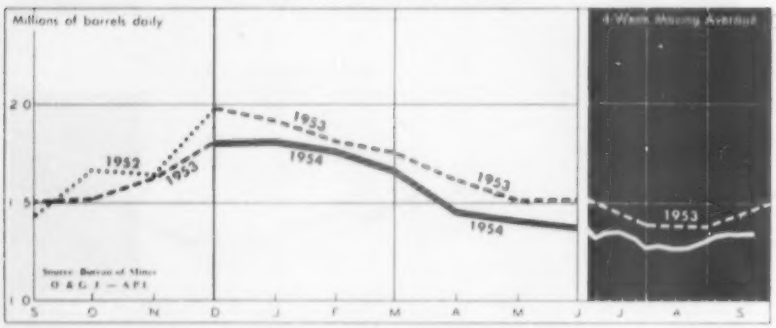
TOTAL GASOLINE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week Moving Average
1953
1954
Source: Bureau of Mines
O & G J — API
S O N D J F M A M J J A S

TOTAL MIDDLE-DISTILLATE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week Moving Average
1953
1954
Source: Bureau of Mines
O & G J — API
S O N D J F M A M J J A S

TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of September 29, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9-9.25	9.95-10.10	8.875-9
No. 2 straw fuel oil	8.25-8.5	8.95-9.35	8.375-8.5
No. 6 residual	$1.20-1.25	$2.25	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.5	4.75
Grade 18-55	6.0	5.5	5.75

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Market reports indicate some strengthening of light fuel markets in all important consuming areas. Prices increased on the Gulf Coast and East Coast. Some Group 3 discounts in effect during September will be reduced beginning October 1.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 9-24-54	3,415	3,631
July 1954	3,385	3,723
August 1953	3,517	3,544
September 1953	3,422	3,579
Middle distillate:		
Four weeks ended 9-24-54	1,796	1,298
July 1954	1,711	1,106
August 1953	1,724	1,031
September 1953	1,745	1,453
Residual fuel:		
Four weeks ended 9-24-54	1,088	1,350
July 1954	1,089	1,243
August 1953	1,222	1,411
September 1953	1,203	1,498

SUPPLY AND DEMAND*

(Thousands of barrels daily)

	July 1954	July 1953
Domestic demand	7,113	7,165
Gasoline	3,620	3,579
Kerosine	159	171
Distillate	867	794
Residual	1,166	1,333
Jet fuel	132	100
Lubricants	110	126
L.P.G.	277	311
Other products	780	723
Crude loss	2	28
Exports	372	364
Gasoline	103	111
Kerosine	15	16
Distillate	65	77
Residual	77	57
Jet fuel	3	3
Lubricants	42	37
L.P.G.	10	7
Other products	22	16
Crude	35	40
Total demand	7,485	7,529
Gasoline	3,723	3,690
Kerosine	174	187
Distillate	932	871
Residual	1,243	1,390
Jet fuel	135	103
Lubricants	152	163
L.P.G.	287	318
Other products	802	739
Crude exp. and loss	37	68
Stock change	439	670
Crude	−8	41
Products	447	629
New supply	7,923	8,199
Imports	1,038	894
Crude	724	629
Products	314	265
Production	6,885	7,253
Crude	6,242	6,603
Natural gasoline, etc.	643	650
Runs to stills	6,916	7,103

*Bureau of Mines.

(The schedule of selected crude prices appeared on page 190 of September 27 issue and will be printed again next week.)

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FOR SALE EQUIPMENT

WILSON ATLAS. Sales Price—$21,000.00. Equipped with two L1-600 Cummins Diesel Engines in good condition: includes pump drive, 12 PD groove sheave and V-belts. One American cathead and one plain spool cathead. Compound enclosed oil-bath. Includes one 1000 gal. fuel tank. Contact Cardwell, Houston.

FOR SALE: GM 122400 (Twin 6-110). 415 continuous bhp. Torque converters. 12 months old. Excellent condition. Also, good used Buda JL-1335. Ike Ridenhour, 1758 N. Bluff, Wichita 14, Kansas.

FIVE TYPE 80 COOPER Gas-Engine compressors. Thirty 20-in. stroke compressor cylinders—size 5½ in. to 26 in. Pressures to 1,000 lbs. W. S. Smith, 205 Thompson Bldg., Tulsa, Okla.

FOR SALE: Model "K" Cardwell tubing and rod unit complete with tubing and rod tools, mast, mounted on Ford tandem truck. Melco Drilling Company, Seminole, Oklahoma. Terms.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE
NEW
DRILL PIPE

185 joints (Approximately 5,550') of new 3½" OD 13.30# Grade D Spang External Upset, Internal Flush drill pipe. Equipped with 5" OD Spang Double Seal Shrink Thread Internal Flush Tool Joints. Range 2. Location—Oklahoma City. Price —$388.84 per 100', plus sales tax.

Contact Gentry.

Phillips Petroleum Company
Bartlesville, Oklahoma.
Call LD 25—Ext. 200.

FOR SALE

Refinoil Plant for Reclamation of Oil. 90 to 100 gallon size. Excellent condition. Attractively priced.

Hyman-Michaels Company
122 South Michigan Avenue
Chicago 3, Illinois

FOR SALE EQUIPMENT

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

MODEL RL CARDWELL Three Drum Spudder, 65' Double leg mast reinforced for trunnion mount, heavy sub frame, powered by model 145 GK Waukesha Engine with combination natural gasoline, butane fuel system and fireproofing equipment. Also equipped with Wire Lines, Dog House, Light Plant and Tools ready to operate. Excellent Condition. 36L Type EB Bucyrus rig, Late Type, equipped with 145 GK Waukesha Engine, Wire Lines, Dog House, Light Plant and Tools, ready to operate. These rigs can be seen working in West Texas. Contact by phone, Midland, Texas, 2-4743 or write Route 1, Box 47C.

36,000' 6⅝" OD 18.97 Plain End Beveled New Southchester Lap Weld Line Pipe. For Quick Movement Offer Nice Discount. Pipe Located in El Dorado, Arkansas. Telephone, Wire or Write Louisiana Iron and Supply Company, Shreveport, Louisiana.

PAIR SURPLUS 1879 Buda engines completely overhauled since use, each equipped with Twin Disc 27-inch hydraulic couplings. Engines located Wolf Trucking yard, Edmond, Okla. Price for pair, $7,000.00. Chester H. Westfall. Phone 4-3144, Tulsa.

USED EQUIPMENT

Franks East Texas Unit, mounted on K-10 International Truck. Located in Seminole area.

Franks Model 65/44 DTRD Double Drum Trailer Mounted Workover and Drilling Rig. Serial 1327 96', 150,000# Telescoping Derrick. Located at Alice, Texas.

Franks 7000 Single Drum Skid Swabbing Unit mounted on Dodge Tandem Truck. Located Odessa, Texas.

Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.

O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Franks Super Senior Well Servicing unit 8 x 10 x 62 Single Pole Mast mounted on Tandem International Truck. Located Seminole, Oklahoma.

Write, wire or call Franks Mfg. Corporation, Box 3218, Whittier Station, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

FOR SALE: Sullivan 200 complete with all tools ready to work. Located Tulsa, Okla. Contact R. F. Mesker, Phone 6-0057 or 5-9357, Tulsa.

FOR SALE: Hopper Blitz Rig 4,000 feet capacity—Bender Mast—G.M. Diesel powered—completely portable with tools, drill pipe. Krug Exploration and Drilling Co., P. O. Box 53, Station B, Bakersfield, Calif. Phone—Fairview 3-3529.

ONE MODEL K Cardwell Spudder, fully equipped, excellent condition, operating in tri-state area. For further information write Box H-263, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126 Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colo.

U-15 WITH hydromatic brakes, powered by four 250 Horse Power Cummins diesel engines through hydraulic couplings with 12" Lee C. Moore mast, 4½" drill pipe, 6¼" drill collars. Oilwell 14P pump, mechanical Shaffer double BOP and all accessories for complete rig. First class operating condition. Rocky Mountains. Inventory on request. Box H-405, The Oil and Gas Journal, Tulsa, Oklahoma.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE
EMSCO GB 800 RIG

This rig fully equipped with many extras. Less than 45,000' of hole drilled with rig and accessories since new. Inventory includes grooved drum, dynamatic brake, heavy duty mast, 12 foot substructure, 2 pumps including Gardner-Denver 800 H.P. GXR, 3 LRDU Waukesha Diesel Engines, Steel Mud Tanks, 4½" Grade E Hand Banded Drill Pipe, 6¼" and 7¾" Drill Collars. This rig is priced right. For details contact

BOX H-307, THE OIL AND GAS JOURNAL,
Tulsa, Oklahoma

FOR SALE EQUIPMENT

ROTARY RIG COMPLETE: 2,500 to 5,000 ft. capacity. Easily Portable. 4½-in. drill pipe. Double derrick, 7-ft. substructure. Model "S" Cardwell drawworks, 14-in. Gardner-Denver pump powered by LRO Waukesha. Located near Sterling, Colo. R. V. Dillard, Phone 1177 or write Box 992, Duncan, Okla.

GASOLENE PLANT
FOR SALE

Our Arkansas City, Kansas, Gasolene Plant is available for purchase and removal by January 1, 1955. Inventory and price upon request.

Cities Service Oil Company
PATRIDGE, BARTLESVILLE, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE—At our Oklahoma City warehouse: 1 used 2"-5" x 10" Fig. 1450 Wheatley Power Pump, Ser. WBM 2060, mounted on steel base & DC to Buda BTH motor, Ser. No. 226569A. Price $2000.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

WILSON GIANT—Serial No. 6383. Sales Price—$6,000. Equipped with Two Waukesha 145 GK Engines in good condition. General Appearance—Fair. Rig used for Work-Over. Price includes Kelco Spinning and Foster Breakout Catheads; Stromberg - McCreary Air Starters on Engines. Brakes circulating water-cooled; Manual Friction Clutches in Transmission; Others — Jaw Clutches. Rig has Slush Pump Drive and Rotary Drive. Location of Unit—Lake Charles, Louisiana. Contact Cardwell, Houston.

COMPLETE RIG: New U-15 Drawworks with four 250 Horse Power Cummins diesel engines through hydraulic couplings, hydromatic brakes on 127-foot 450,000-lb. Lee C. Moore mast and substructure, 8,000 Ft. 4½" Drill Pipe, 14 new 7" O.D. x 2⅞" Bore Drill Collars, new Emsco D-500 7½" x 16" pump, new Cameron twin hydraulic BOP, and all accessories. Good condition. Now drilling 8,000-foot well in Rocky Mountain area. Inventory on request. Box H-403, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

FOR SALE—At our Oklahoma City warehouse: 1 used 2½"-5" x 10" Gaso Power Pump, Figure 710-S, Serial No. 7435 on steel base and V-belted to HXE Hercules motor, serial No. 330493. Price $2000.00. Cities Service Pipe Line Company, Patridge, Bartlesville, Oklahoma.

FAILING MODEL 55 portable drill. Capable 2500 ft. drilling. Rig and pump powered with GMC diesels. Complete rig, including drill pipe, dog house, fuel tank, and operating tools. Now operating in eastern Kansas. M & G Drilling Co., 1102 East St., Iola, Kansas.

FRANKS MODEL 5000 Spudder — Serial No. 866. Sales Price—$7,500. Equipped with one Cummins HB1-600 Engine in good condition. Brake Rims in fair condition; Brake blocks—Good. General appearance—Good. Chains—Good. Basic Machine equipped with Spudding attachment. Skid and 65' Double Leg Pipe Mast with 8⅝" and 7" Pipe Legs; 4-Sheave Crown of Wilson Manufacture. Price includes Mast Guy Lines. Location of Unit — Western Kansas. Contact Cardwell, Wichita.

1—MODEL RL 3-Drum Cardwell Powered with Buda Model 844D Diesel Engine. Rig and Engine in Perfect Condition. 1-87' 2-Pole Mast. Box H-404, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

WATER FLOOD EQUIPMENT located near Norris City, Illinois. One water softener consisting of one CBZ-175 accelerator mechanism complete with 14 feet x 13 feet welded steel tank, one No. 72 Forced Draft Aerator, two motor driven centrifugal pumps, two 9-D chemical feeders, two No. 1 suction boxes and miscellaneous fittings. Shell Oil Company, Centralia, Illinois.

34—NEW JARECKI screwed Angle Globe Gas Relief Valves with Lever and Weight. F.O.B. Tulsa, $14.95. Less the Weight, F.O.B. Tulsa, $12.50. Hoil Engineering Corp. P. O. Box 5094, Tulsa, Okla.

FOR SALE: Franks SAL 6000, recently overhauled, also new drilling line and brake blocks installed; Franks 96 foot mast; 3—200 HP Cummins Diesels in good shape with V-belt compound; 7¼" x 16" Gardner-Denver pump, 6' flywheel; 4' substructure; 6400' of 3½" IF drill pipe; 6 brand new drill collars and three old ones; one 8x5x29' steel mud tank; steel dog house; steel pipe racks; and jets, wrenches, etc. Rig can be seen 6 miles north and three miles west of Ordway, Colo. Contact DeVere Robinson, Salt Lake City, Utah. Phone 7-0049 or write 1940 S. 11th E.

FOR SALE, used Tex-Steamers, one twenty horsepower gas fired, two forty horsepower oil fired. For details write Texsteam Corporation, P. O. Box 9127, Houston 11, Texas.

THREE #12 Sweetland Filters, 48 bronze leaves, monel covered, on 3" C.C., now located in southwest, available for inspection. 11 Sperry 18" x 18" cast iron Filter presses, 11 chambers. Consolidated Products Co. Inc. #65 Garden Street, Hoboken, N. J. N. Y. Tel.: BArclay 7-0600.

FOR SALE—3 Gaso Figure 1847 3" x 6" Horizontal Duplex Piston Power Pumps with No. 6200 Ampco Bronze Fluid End, complete. Purchased new in 1947 and 1948 for salt water flood use. Price $850.00 each. Cities Service Oil. Patridge, Bartlesville.

FOR SALE: 300' 16" OD 70# 8-V R-1 Lap Weld Casing. 300' 13" OD 50# 8-V R-1 Lap Weld Casing. 5000' 8⅝" OD 32# R-2 8-V SS Casing. 6000' 7" OD 24# R-2 8-V SS Casing. All #1 Used—Priced to Sell. Everitt-Whiting, Inc. 810 Daniel Building, Tulsa, Okla. Phone 54-6082, Tulsa, Okla., or 750, Okemah, Okla.

FOR SALE—Motorola two-way radio system for Petroleum industry complete with two base stations. 1 set for drilling rig complete with generator and antenna, two 6-volt mobile units and one 12-volt mobile unit. This equipment is in perfect condition just one year old. Will sell at discount. Contact Wycoff Drilling Company, Oakley, Kansas.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

WORTHINGTON HIGH PRESSURE PUMP

3 x 12 Horizontal Plunger Double Acting Power Pump. Type KUF, 106 GPM @ 2200 PSI Discharge Pressure

With direct coupled GE 100 hp, 495 rpm, 220 volt slip ring motor and magnetic controller. Like NEW. Offered at 35% of new price.

ACME EQUIPMENT CO., INC.
126 S. Clinton St., Chicago 6, Ill., Phone ANdover 3-3430

FOR SALE

Caterpillar D13000 oil field, tropical type, large capacity radiators, complete with oil cooler.

Description: 65" high by 49" wide by 15" thick; includes sheet metal enclosure and guards, 40" fan, fan bracket and bearings; equipped with 2¾" flange inlet opening and 1-17/32" flange outlet opening; weight, 925 lbs.; consists of seven separate Modine AX4300 Cores.

Capacity: (conservative) 7500 BTU per minute at 200° F. top tank temperature and 110° F. ambient air; designed to cool D13000 Engine operating at 1000 R.P.M. at 125° F. ambient temperature.

For use with: D13000 Engine, Serial Nos. 4S1001-up and D13000 Electric Set, Serial Nos. 2V5001-up. No additional parts needed for mounting on above engines; can easily be adapted to older D13000s. The net price is **$436.00** F.O.B. Factory, Peoria, Illinois. Contact

ENGINE ORDER DIVISION
CATERPILLAR TRACTOR CO.
PEORIA 8, ILLINOIS

FOR SALE EQUIPMENT

NEW HD5 ALLIS-CHALMERS Tracto Shovel with 1¼ yard bucket, used TD14 International Tractor with 8' Bucyrus Hydraulic Dozer, HD7 Allis-Chalmers Tractor with Baker 9' Dozer, 212 Caterpillar Motor Grader, 1951 2 Ton GMC Truck with Loboy Trailer and Everett Ditcher mounted on a Ferguson Tractor. This equipment is all in excellent condition. Contact by phone, Midland, Texas, 2-4743, or write Route 1, Box 47C.

EQUIPMENT WANTED

WE WANT TO BUY—Treated Crude Oil Tank Bottoms. Box H-428, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WE PAY THE MOST for Used Line pipe, used casing, abandoned leases. Gore Oil Field Supplies. Box 1063, Tulsa, Okla.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

OIL INDUSTRY Employment Service. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Oklahoma. For technical and trained oil industry personnel. Write for blank.

PROCESS ENGINEERS

Chemical Engineers with advanced degrees required for process design and evaluation work. Minimum five years' experience in process design, petroleum or organic chemical facilities required. Send complete resume. Box H-420, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Senior Research, to work in New York. Applicant should have advanced degree and broad experience in petroleum geology, foreign and domestic. Work involves compilation of geological data, evaluation of foreign petroleum prospects and preparation of reports. Important petroleum organization offers this position of responsibility and appeal to the right party. Pay commensurate with education and experience. Age range, preferably 35 to 50. Submit resume in detail. Box H-417, The Oil and Gas Journal, Tulsa, Oklahoma.

LAND MANAGER

Independent oil company has opening for experienced land man to direct and supervise land and geological activities. Must be familiar with Mid-Continent and Rocky Mountain areas. Must be capable of handling all phases of land and geological operations; age under 40; major oil company experience preferred. Good opportunity for right person. In replying give past employment, educational background, etc. All replies handled strictly confidential. Box H-452, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

SOUTH AMERICA
MAJOR OIL COMPANY

HAS OPENINGS IN COLOMBIA FOR

Petroleum Engineer (Equipment)—At least four years' experience as equipment engineer for testing, maintenance and operation of drilling and production equipment.

Drilling Engineer—Prefer Petroleum Engineer with six to eight years' minimum in drilling activities. Thorough knowledge modern drilling practices and techniques. Some administrative experience.

Petroleum Engineer—Minimum four years' experience in work-overs, well completion, maintenance and operation of drilling and production equipment.

AGE LIMIT 40 YEARS
SALARY OPEN

BOX H-432,
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

MUD PUMP DESIGN Engineer with experience to develop line of pumps for Drilling Rigs. Please give record of education and experience and salary expected. Box H-427, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.
505 Park Avenue, New York 22, N. Y.

GASOLINE PLANT OPERATORS

Experienced gasoline plant operators needed by substantial independent. Location Central West Texas. Company new and expanding. Liberal insurance, vacation, and other benefits. When replying give age, experience, availability.

BOX H-425,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

SITUATIONS WANTED

GEOLOGIST - GEOPHYSICIST. 36, Married, degree in geology, 14 years of interpretation and supervisory experience, desires position in permanent location. Box H-418, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERINTENDENT: Twenty years experience in supervision, all phases processing plant and pipeline station construction with major engineer-constructors. Mechanical Engineering degree. Box H-453, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING EXECUTIVE—Chemical engineer with 22 years broad experience in Petroleum refining covering Process design, development, licensing, economics, sales, construction and operation, seeks connection with aggressive, expanding corporation engaged in or serving Petroleum refining or Petrochemical fields. Box H-450, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED MAN, having recently completed organization of producing company, desires connection with substantial group or producing company. Experienced in land department and supervision of production and drilling operations. Midwestern area preferred. Sound reason for wanting new connection. Box H-447, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P. O. Box 1628, Hobbs, New Mexico,
Phone 3-3141.

146 Allen Building, Midland, Texas,
Phone 2-2962.

SITUATIONS WANTED

PETROLEUM ENGINEER, 34, Married, 10 years—part time supervisory—diversified drilling, producing, remedial, reservoir, and associated experience in Gulf Coast. Desire position with organization offering opportunity for advancement. Will relocate. Box H-442, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, M.S., 35, family, 7 years experience including one year in oil. Experienced in Recent Sedimentation and Stratigraphy, also research. Box H-435, The Oil and Gas Journal, Tulsa, Oklahoma.

OCEANOGRAPHER, Geological. 35, 5 years responsible experience in Coastal Engineering. Box H-438, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIAL MAN—15 years office and field experience, Drilling and Production. Best references. Box H-431, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER, Ph.D. Ch.E., Registered, married, age 32. Nine years diversified experience, research development, petroleum process design. Top qualifications. Supervisory and business capabilities. Details furnished upon request. Box H-446, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM RESERVOIR ENGINEER with 5 years extensive experience with major oil company, desires responsible position with progressive organization. Proven ability in reserve estimation, reservoir evaluation, and secondary recovery. Box H-448, The Oil and Gas Journal, Tulsa, Oklahoma.

PROJECT ENGINEER: Oil Refinery and Petrochemical Plant design and construction. Registered. B.Ch.E. Three years project, four years process experience. Box H-451, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER—several years refinery engineering and supervisory experience. Desire position in refinery or petrochem plant. Box H-454, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Single, 29 years old, B.S. degree plus some graduate studies. 18 months geological well site logging; 18 months in geophysics. Desire position in exploration geology—domestic or foreign. Box H-424, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

Manufacturers' Representative

Experienced salesman in production and drilling equipment, desires a reputable line preferably for Northern Oklahoma. Box H-445, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer Electric Log Cabinet. Two compartments to each drawer with separate follow-blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for Catalog 352-B. Ross-Martin Co. P.O. Box 800-A, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced, American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For all production-reporting forms, plat sheets, all administrative forms, columnar pads, truck reports, material transfer forms, ask for Catalog 854-K. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

ROYALTIES

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 522 Wright Bldg. Tulsa, Okla.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

LEASE AND DRILLING BLOCKS

TO LEASE—Michigan area acreage near Muskegon. Write—E. O. Goldthorp—116 South York Street—Elmhurst, Illinois.

RECENTLY ORGANIZED group seeking drilling deals accompanied by complete geological reports. Box H-423, The Oil and Gas Journal, Tulsa, Oklahoma.

$2250.00 drills, oversees, 920 ft. well. 120 OKLA. lease. Offsetting 6 Bbl. Natural well. Sixteenth override. Geologists report, maps, logs. Chas. Byron, 1071 York, Denver, Colo.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

WELL TO BE DRILLED soon on already producing anticline in the heart of real oil country. Natural and hydrafrac possibilities. Interest reasonable. Box H-440, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER FLOOD oil lease for sale, incomplete, has 1200 acres, five wells plus water wells, Gaso pressure pump, tanks and other equipment, owner Mr. O'Chamis, Tioga Hotel, Chanute, Kansas.

160 OIL LEASE Farnam Dome, Utah, near new gas well. Bargain. R. O. Barnsley, 950 Lincoln Ave. Palo Alto, California.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and you haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY
6835 Delmar Ave., St. Louis 5, Mo.

BUSINESS OPPORTUNITY

$69,000 HAS GROSSED over $500,000 in first 2 years. Producer of 60 low cost motion pictures desires asso. to finance popular adventure pictures in full color. Money repaid from entire first returns plus 45% share. Tax ad. Low risk. Box H-444, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

WANTED COMMISSION SALES for Oilfield Equipment in Kansas, have ample Warehouse, Yard and Showroom Space. Qualified Salesman, experienced stockman, also rental space available for consigned material. Write Box H-436, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL WANTED

Petroleum Geologist-Oil Producer wishes to contact qualified companies or small groups of individuals to spend tax money in the Denver-Julesburg Basin on drilling wells. This area is particularly attractive due to the high discovery ratio. We can furnish for your examination the best available geology. References exchanged.

BOX H-449,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

PRODUCTION WANTED

HAVE CASH BUYER for up to one million dollars in production in one or more leases. Prefer Okla., but would consider Arkansas, Texas, Kansas, La. Would like partially developed leases. Include full details in reply. Box H-437, The Oil and Gas Journal, Tulsa, Oklahoma.

NEWLY ORGANIZED syndicate wants to buy 5,000 to 30,000 barrels oil monthly production. You will deal direct with principals. Prompt action. Evaluation report must accompany submittal. Box H-422, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

We will purchase any amount of settled production up to 500 barrels per day provided you control operations. Interested in Kay, Logan, Noble, Garfield, Payne, Pawnee, Creek, Okfuskee or Lincoln Counties. We are producers and operators and will furnish bank references if your proposition interests us. Would like full details with first letter.

BOX H-415,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

BUSINESS OPPORTUNITY

$4,000,000,000

RAW MATERIAL (PIGMENT) DEPOSIT

Sell or Lease

PROMOTERS FINANCIAL MEN CORPORATION

This pigment deposit offers a golden opportunity to put your excess capital to work, form your own corporation to take over this deposit, above dollar figure is not for purpose of negotiating, it represents wholesale net profit if processed and sold for certain use. Pigment is a high grade natural industrial filler, deposit particle size, fine enough for most use with out process, use—practically all industrial fields and products in which a filler is a part, field, unlimited, ready market available. Qualified, Investigate now, Write

C. G. Nitz, 212 N. 64th St., Milwaukee 13, Wisconsin

WILDCAT COMPLETIONS

(Continued from page 232)

Palomar Oil & Refining Co. 1 Kane-Intex, 30-27s-27e. Dry. Etchegoin 2,510 ft., TD 2,910 ft.

Lloyd Wright 85 31, 31-11n-18w. Dry. TD 2,713 ft.

Kings County: Corwin Drilling Co., 1 McCracken, 4-24s-22e. Dry. TD 2,907 ft.

Los Angeles County: Richfield Oil Corp., Operator 82-35 Rynne-Fisher, NE NE 35-5n-17w, IPF 276 BOPD, 12/64-in. choke, 34.7° gravity, 138 M.c.f. gas, perfs. 5,449-6,009 ft., deepened from 5,174 ft. in Sterling sand, TD 6,018 ft. (Deeper pool discovery in Castaic Hills field.)

The Texas Co., Operator, 11 Honor Rancho, 31-5n-16w. Dry. TD 2,492 ft.

Tulare County: Franco Western Oil Co., 28-21 Drilexco-Cooper, 21-22s-26e. Dry. TD 3,723 ft.

MONTANA

Fallon County, Plevna: Pure Oil Co.-Texas Pacific 1 NP, SE SW SW 17-4n-61e. Dry. TD 8,915 ft. Red River.

Fergus County, Ford Dome: Empire State Oil Co. 1 Ford, C SE NE 3-22n-20e. Dry. TD 6,188 ft. Cambrian.

Glacier County, Cadmus: Union Oil Co. of California-Carter Oil Co. 1 Miller Tribal 470, C NW NE 7-33n-6w. Temp. abd. TD 4,782 ft. Potlatch.

1 Tribal 583, C SE SE 13-37n-9w. Landslide Butte area: Temp. abd. TD 5,933 ft. Potlatch.

Golden Valley County, Big Coulee Hailstone Dome: Northern Natural Gas Co. 2-A NP, NW SE 31-5n-20e. IP 5,580 M.c.f. of gas per day, 3rd. Cat Creek discovery, new field. TD 2,145 ft. Morrison.

Rosebud County, North Porcupine: Phillips 3 NP, C SE SE 7-11n-39e. Dry. TD 3,140 ft.

Valley County: Nashua area: Burt Fields 1 Figmaka, C SW NE 14-27n-39e. Dry. TD 7,495 ft. Winnipeg.

Wibaux County, Wibaux area: Lion Oil Co. 1 Knight, C SW NW 29-14n-60e. IP 118 BOPD, Red River discovery, new field. TD 11,153 ft. Red River.

NORTH DAKOTA

Rolette County: Shell 1 Amble, SE SW 10-159n-71w. Dry. TD 3,040 ft. Nisku.

NEVADA

Nye County: Shell Oil Co. 1 Unit, SE NE NW 35-9n-57e. IPP 347 BOPD, new field. TD 10,358 ft.

WYOMING

Carbon County, Elk Mountain: Aurora-Kingwood 1 Unit, SE SE SW 28-18n-81w. Dry. TD 2,536 ft. Morrison.

UTAH

San Juan County, Fish Creek: Great Western Drilling Co. 1 Unit, C NW NW 22-38s-20e. Dry. TD 4,844 ft. Elbert.

Uintah County: Howard Bell 1 Gillbergh, C NE SW 23-2n-1w. Dry. TD 3,001 ft. suspended.

Gulf Oil Corp. 1 Ute-Federal, C SW SE 12-4s-22e. Brush Creek area. Dry. TD 6,788 ft. Manning Canyon.

COLORADO

Adams County: Potter Drilling Co. 1 Hunt, SE SE SW 24-1s-60w. Dry. TD 6,353 ft.

Sinclair Oil & Gas Co. 1 Michel, NW NE NE 18-1s-58w. Dry. TD 6,270 ft.

Logan County: Herndon Drilling Co. 1 Blair, SE SW NE 26-9n-51w. Dry. TD 4,510 ft.

Morgan County: Barnes & Brown 1 Blake, SW SW SW 26-2n-55w. Dry. TD 5,095 ft.

C. M. Crawford, Jr. 1 Huey, NW NW SW 35-2n-57w. Dry. TD 5,625 ft.

Al Daniels 1 Logan, SW SE SE 29-3n-57w. Dry. TD 5,563 ft.

Denver Basin 2 Morris, NW SE NE 20-2n-56w. Dry. TD 5,281 ft.

Virgil King and New Drilling Co. 1 Reid, SW SW SW 20-1n-60w. Dry. TD 6,644 ft.

Buck Wilson 1 Schroeder, SW SW NW 18-2n-57w. Dry. TD 5,787 ft.

Washington County: New Drilling Co. 1 Brown, NE NE SW 15-1s-54w. Dry. TD 4,905 ft.

Weld County: Phillips Petroleum Co.-W. R. Edmonson, Calvert Drilling Co. 1 Compton, C NE NW 5-9n-60w. Dry. TD 7,429 ft. "J" sand.

MANITOBA

Dome-Harris-Cox 16-1 Belleview, LSD 16, 1-8-26w1. Dry. TD 2,720 ft.

McCarty & Coleman 1-31 Forbes, LSD 1, 31-6-22w1. Dry. TD 2,452 ft.

Dome-Harris-Cox 4-17 North Oak Lake, LSD 4, 17-9-24w1. Dry. TD 2,185 ft.

SASKATCHEWAN

Imperial 11-17-27-26 Bailey, LSD 11, 17-27-26w3. Dry. TD 2,461 ft.

Canada Southern 6-10 Clearsite, LSD 6, 10-10-29w3. Dry. TD 4,758 ft.

Tide Water-Imperial 2 Climax Crown, LSD 16, 20-1-18w3. Dry. TD 4,710 ft.

Mayrath 18-16 Elbow, LSD 16, 18-25-5w3. Dry. TD 2,950 ft.

British American-Husky-Phillips 16-30 Lost Horse, LSD 16, 30-10-8w2. Dry. TD 4,197 ft.

Canso Oil Producers-New Superior et al 6-30 Hopedale, LSD 6, 30-31-22w3. Viking gas well. TD 2,310 ft.

Shell A-8-12 Huntoon, LSD 8, 12-7-10w2. Charles oil well. TD 4,753 ft.

Central-Del Rio 6-19 Red Jacket, LSD 6, 19-13-32w1. Dry. TD 3,118 ft.

Tide Water 5-4 Rapdan Crown, LSD 5, 4-4-20w3. Dry. TD 4,914 ft.

Phillips-Husky 1 Westerham, LSD 4, 12-23-27w3. Dry. TD 3,270 ft.

ALBERTA

Oilwell Operators et al 11-26 Granada, LSD 11, 26-53-10w5. Indicated basal quartz oil well. TD 6,285 ft.

Bay 16 Strilchuk, LSD 16, 21-47-17w4. Dry. TD 2,820 ft.

Shell-Fleetwood 3-1 Ghost Pine, LSD 3, 1-31-22w4. Dry. TD 6,937 ft.

Cal-Standard 3 Grassy Island Lake, LSD 11, 2-32-5w4. Viking gas well. TD 2,835 ft.

Mill City 16-29 East Kessler, LSD 16, 29-38-7w4. Dry. TD 2,417 ft.

Homestead 1 Howard, LSD 2, 19-51-25w4. Dry. TD 5,820 ft.

Seaboard-Banff 7-9 Wimborne, LSD 7, 9-34-26w4. D3 oil well. TD 7,525 ft.

Evans-Union 16-18 Wrentham, LSD 16, 18-7-16w4. Dry. TD 3,450 ft.

LEGAL

SEALED BIDS will be received until 2:00 P. M., Mountain Standard Time, October 20, 1954, and opened at that time in the Office of the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 16,714.42 acres of Tribal land and 14,751.68 acres of allotted Indian land, located in Roosevelt and Valley Counties, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Peck Indian Agency, at Poplar, Montana, or telephone, Poplar, 2181.

ADVERTISERS

Aerofin Corporation 166
Air Preheater Corporation, The 94
Allis-Chalmers Mfg. Co. 50, 63
Alten Foundry & Machine Works, Inc. 208
Aluminum Co. of America 60
Amercoat Corporation 24
American Iron & Machine Works Co. 217
American Locomotive Company 25
American Photocopy Equipment Co. 174
Ammann Photogrammetric Engineers, Inc., Jack 212
Ansul Chemical Co. 28
Armco Drainage & Metal Products, Inc. 147
Atlas Powder Company, Chemicals Department 233, 234, 235, 236
Axelson Manufacturing Company 16
B and W Inc. 226
Baird Mfg. Co. 178
Baker Oil Tools, Inc. 100
Barco Manufacturing Company 197
Beech Aircraft Corp. 6
Bethlehem Steel Co. 190
Black, Sivalls & Bryson, Inc. 8
Bristol Company, The 97
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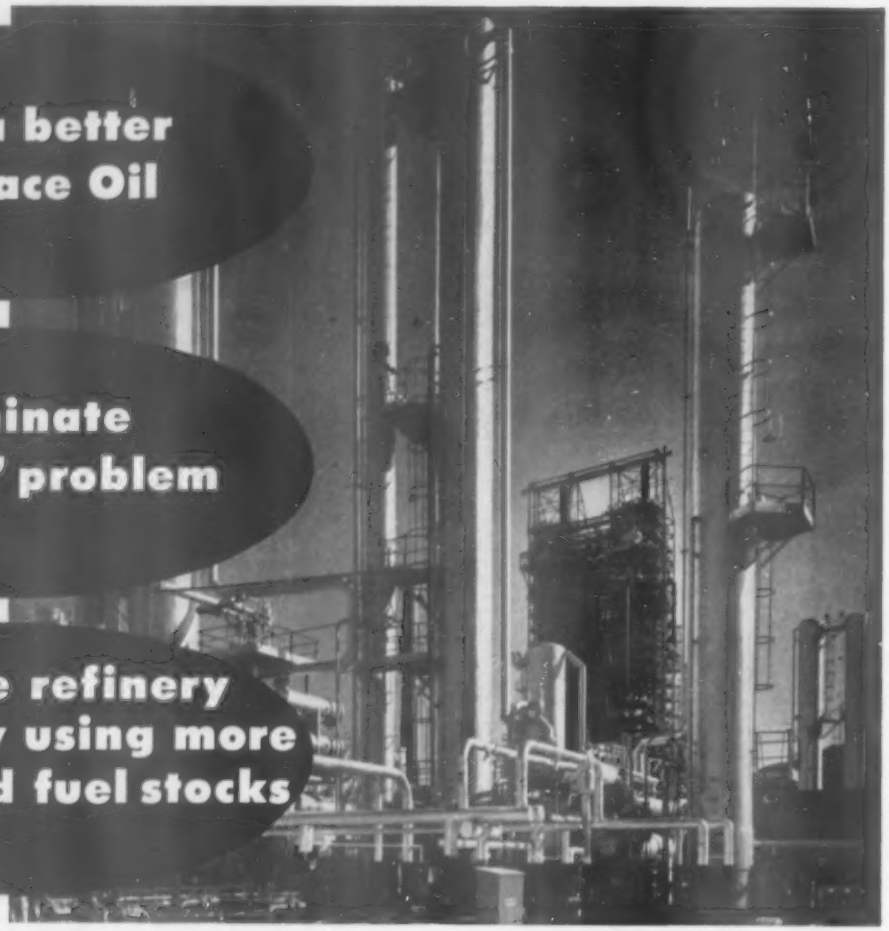

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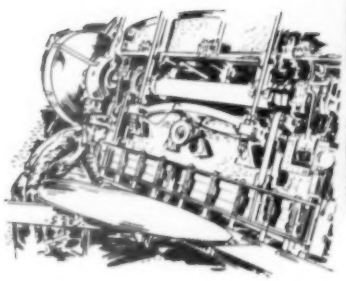

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